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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

ANNUAL REPORT

OF

ALASKA AGRICULTURAL
EXPERIMENT STATIONS

FOR

1913.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

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**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA,
RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL

SITKA, ALASKA, *March 3, 1914.*

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations for the year 1913.

Very respectfully,

C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

D. F. HOUSTON,

Secretary of Agriculture.

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ANNUAL REPORT OF ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1913.

SUMMARY OF WORK AT THE STATIONS.

By C. C. GEORGESON, *Special Agent in Charge.*

SITKA STATION.

There was no deviation from the plan followed during former years. The work consisted in (1) further testing out of hybrid strawberries; (2) testing of cauliflower and cabbages; (3) testing of potatoes; (4) further testing of fruit trees; (5) the growing of nursery stock, including basket willows; and (6) the clearing of an acre of land. (Pl. I.)

HYBRID STRAWBERRIES.

Last spring all the seedling plants which had fruited and whose fruit did not come up to a certain standard of size and quality were removed. By this means about nine-tenths of the seedlings that had fruited were discarded, only about one-tenth being retained as worthy of further observation. When the plants first fruited the best ones were selected by comparative test, and these selections were given yellow labels to distinguish them from plants of undetermined value. These yellow-label plants were propagated by runners in order that there might be a larger number of plants, preferably between two and three hundred of each kind to work with, the better to note variations. These young plants were planted in rows some 2 feet apart in the summer of 1912. They were permitted to establish their runners for the double purpose of obtaining more plants and to afford a chance to study them when grown in matted rows. These plants fruited quite freely during 1913, but it was found that the matted-row system is not at all adapted to these hybrids. (Pl. II, fig. 1.) The plants are too vigorous. The leaves are large, and they shade the fruit almost completely, with the result, as a rule, that the fruit was not as highly colored as it ought to be, and the further

result, due to the wet climate, that the berries were kept wet nearly all the time. They rotted quickly and were soft. It was learned from this that all these hybrid strawberries must be grown on the hill system, as single plants, and they must be given plenty of room. (Pl. II, fig. 2.) It was also found necessary to mulch the plants with straw or similar material to keep the berries from becoming muddy by contact with the soil. A few crates of berries were shipped to Juneau to test their shipping qualities, and the report in every instance was that they arrived in poor condition, due to the softness of the berry and the continued rainy weather during the picking season.

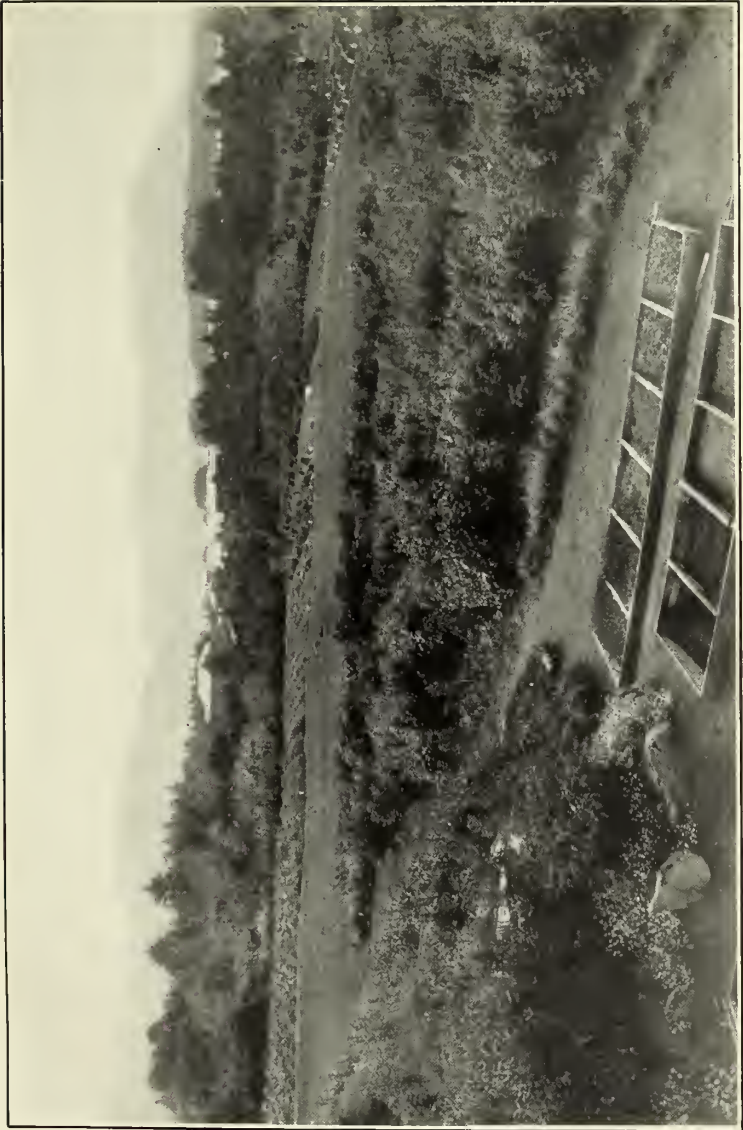
There is no discount on the quality of the fruit. Nearly all the seedlings produced fruit of high flavor, comparable to the flavor of the wild strawberry, and some of them even partake of the fragrance of the wild berry, though this characteristic is not prominent. While the quality is high in the majority of the seedlings, it is also true that some very handsome berries are insipid and flavorless. These will, of course, be rejected. As yet the seedlings are known by numbers only.

Several hundred new seedlings were raised and set out. Many of these will probably be lost during the winter by the heaving of the soil, due to frost. It never is cold enough to injure the plants directly. They are extremely hardy, measured by their ability to stand low temperatures; but the winter climate is nevertheless trying to all young plants. The spongy soil absorbs and holds much moisture, freezing raises the crust and tears the roots of the plants, and when thawing weather again causes the soil to settle the plants are left loose and partly raised from the ground, and with repeated freezings and thawings by spring they are left on the surface dead. This condition has been partly remedied by covering the plants with spruce boughs to keep the ground from thawing, but it is only partly successful. Large plants do not suffer from this cause to the same degree as do the smaller ones.

During the coming year it is expected to make final selections of a few best varieties which will then be propagated for distribution. It is planned to continue the hybridization work, and for that purpose many other cultivated varieties will be used for mother plants and also to recross some of the hybrids.

CAULIFLOWER, CABBAGE, AND OTHER VEGETABLES.

So much has been said about the growing of cauliflower and cabbage in former years that it was deemed unnecessary to attempt to



VIEW OF PART OF SITKA STATION. RASPBERRIES IN CENTER; HYBRID STRAWBERRIES IN BACKGROUND.



FIG. 1.—HYBRID STRAWBERRIES GROWN IN ROWS, SITKA STATION.



FIG. 2.—HYBRID STRAWBERRIES GROWN IN HILLS, SITKA STATION.

grow more than a few plants of each of some of the leading varieties. About two dozen plants of each of the following varieties of cauliflower were raised: Extra Early Snowball, Dwarf Erfurt, Large Early Erfurt, and Early Paris.

Earliness is an important point. Large Early Erfurt produced the first marketable heads July 15, but they were small and not as good as those produced later by the other three sorts.

Extra Early Snowball produced compact, medium-size, marketable heads by July 22, followed by Dwarf Erfurt, which had marketable heads July 23, and lastly Early Paris began producing heads July 26.

Of cabbages some two dozen plants were set out of each of the following varieties: Early Jersey Wakefield, Copenhagen Market, Large Late Flat Dutch, and Early Winningstadt.

They are valued in the order named, and it is recommended that all gardeners in Alaska make Early Jersey Wakefield the standard variety.

In like manner two varieties of kale were planted. The Dwarf Scotch Green Curled is, all things considered, the best variety tried. The leaves are crisp and curly and well flavored. The Siberian is coarser and inferior in quality, although the plants are larger. Kale should be grown in every garden in Alaska. It is comparatively hardy, and with a little protection is available for greens all winter long in the coast region. It is improved by a slight touch of frost, although a severe frost will wilt the leaves. The plants will keep perfectly out of doors under a foot or more of snow, and they can be dug out as needed. This is, in fact, the most practicable way to keep kale. If the plants are taken up and transferred to the root cellar as we do cabbages, the leaves will wilt and lose their flavor to some extent.

So much has been said about the culture of the foregoing vegetables in former reports that it is not deemed necessary to dwell further upon the matter here.

Brussels sprouts rank next to kale as winter greens. The plants are about as hardy as kale, and they can be kept out of doors without injury from severe freezing weather if protected by a foot or more of snow. If the ground is bare, windy and freezing weather will wilt the plants. On the other hand, Brussels sprouts can be pulled up by the roots, the large leaves removed, and the stalks with the small heads can be kept in the root cellar for a considerable time.

Lettuce, peas, beets, carrots, radishes, and turnips were not experimented with the past year.

TESTING OF POTATOES.

All varieties of potatoes will grow and do fairly well in the coast region. It has been pointed out in former reports that in order to give potatoes time to mature the seed should be sprouted before it is planted. By this means about a month can be gained. The method of sprouting that has been found most convenient is to place a layer of selected whole seed potatoes in a flat, cover them very thinly with soil, and put these flats under cold-frame sashes. Ventilation and watering should be attended to. If prepared this way in the early part of April, they will begin to have green sprouts 2 to 3 inches long by the beginning of May, and they will have also begun the development of a root system. Planting such sprouted potatoes by hand, so that the tips of the sprouts will be even with the surface of the soil, will give them, as stated, a start of about a month over potatoes taken directly from the root cellar and planted. This method is in practice now at all the stations, and it is recommended to all gardeners and potato growers in Alaska. The sprouting is less necessary in the coast region than it is in the interior, for in the coast region the season is usually long enough to mature the crop.

The season of 1913, however, was an exception. A frost sufficient to kill potato vines occurred at Sitka on September 31, which is the earliest killing frost on record at Sitka Station. Such a thing may not occur again in a quarter of a century, but the effect this year was disastrous to potatoes. They did not mature, and there was a large proportion of small tubers in the crop. At Sitka Station a large number of varieties are grown, but only comparatively few hills of each. The object is twofold: First, to test the new sorts that come on the market, and second, to supply seed potatoes from the varieties tested here for further trial at the interior stations. Seed potatoes can not be shipped to those stations in the spring. If they are sent early enough to arrive in time to plant, they would freeze on the way. The new sorts are grown for at least one season at Sitka Station, and about September 1, when the tubers are nearly full grown, selections are made and sent to the interior stations. They can reach their destination before severe cold weather, and they are then wintered in root cellars until spring, when they are treated as above mentioned.

It has not been found advantageous to cut the potatoes for seed, better yields invariably being obtained by planting medium-size whole potatoes. Seed potatoes should not be cut except as a matter of necessity when seed is scarce.

The varieties grown at Sitka in 1913 are listed below, with notes on the color, form of tuber, and characteristics of the eye. So few plants were grown of each kind that it was not deemed expedient to estimate the acre yields.

Variety test of potatoes, 1913.

Name of variety.	Color. ^c	Form.	Eyes.
Bliss Triumph.....	Red.....	Round.....	Medium.
Burpee Superior.....	White.....	Slightly elongated.	Medium to shallow.
California Golden Russet.....	do.....	Long.....	Shallow.
Clark Alaska Seedling.....	do.....	Round to long.....	Medium.
Columbus.....	Flesh.....	Long.....	Medium to deep.
Dakota Red.....	Red.....	Round.....	Deep.
Early Beauty of Hebron.....	Pink.....	Long.....	Medium to shallow.
Early Fortune.....	Flesh.....	Round to long.....	Medium.
Early Six Weeks.....	White.....	do.....	Shallow.
Early John.....	do.....	Slightly elongated.	Medium to shallow.
Epicure.....	Pink.....	Round.....	Deep.
Extra Early.....	White.....	Long.....	Medium to shallow.
Extra Early Ohio No. 1.....	do.....	do.....	Shallow.
Extra Early Pioneer.....	Flesh.....	do.....	Deep.
Gold Coin.....	White.....	do.....	Medium to deep.
Great Divide.....	do.....	do.....	Do.
Green Mountain.....	do.....	Round to long.....	Medium.
Hamilton Early Rose.....	Pink.....	Long.....	Medium to shallow.
Irish Cobbler.....	White.....	Round to long.....	Shallow.
Junior Pride.....	Flesh.....	Long.....	Do.
Keeper.....	Pink.....	Round.....	Medium to deep.
Knowles Big Cropper.....	White.....	Long.....	Medium.
Mammoth Pearl.....	Flesh.....	Slightly elongated.	Deep.
Norcross.....	White.....	Round to conical.	Shallow.
Noroton.....	do.....	Round.....	Deep.
Noroton Beauty.....	Pink.....	Long to round.....	Medium.
Norway No. 1.....	White.....	Round to flat.....	Do.
Peach Blow.....	Flesh.....	Slightly elongated.	Do.
Piqua Chief.....	White.....	Long.....	Shallow.
Pride of France.....	Purple.....	Round.....	Deep.
Pure Early Rose.....	Pink.....	Slightly elongated.	Medium to deep.
Red River White Ohio.....	White.....	Long.....	Shallow.
Rural New Yorker No. 2.....	do.....	Slightly elongated.	Do.
Rust Proof.....	do.....	Long.....	Deep.
Russian.....	do.....	Round.....	Do.
Snowball.....	do.....	Long.....	Medium.
State of Maine.....	do.....	do.....	Shallow.
The Thorburn.....	Pink.....	Round to long.....	Medium.
Uncle Sam.....	White.....	Round.....	Do.
White Beauty.....	do.....	Round to long.....	Do.
White Harvest.....	do.....	Round.....	Do.
White Ohio.....	do.....	do.....	Do.

FURTHER TEST OF FRUIT TREES.

No young orchard ever gave better promise of a crop in the spring than did the little test orchard at this station the past season. Nearly every tree bloomed profusely, and the apples were set so thickly that it was necessary to thin them. By the middle of July the apples were as large as thimbles and gave promise of a full crop. The writer started for the interior July 17 and returned to headquarters the last of August. Upon visiting the orchard to take notes on the crop, it was found that the apples had all dropped off. The trees appeared to be in normal health, and there was nothing to indicate that the drop was due to either disease or insects. The cause has not been determined. There was no unusual drop in temperature during the period named. There was a lack of sunshine and much rainy weather, and these weather conditions seem to be the most likely assignable cause of the trouble. Nor did the native crab apples produce any fruit to speak of, although the trees bloomed profusely and set fruit. The cause was universal in its application.

This loss of the crop was a great disappointment, as it was expected to make comparisons between different varieties. It is to be hoped there will be better success in the future.

The experiments have convinced the writer that dwarf apple trees will do better than standards, and the best way to dwarf them is to use the native crab apple (*Pyrus rivularis*) for stocks. Trees are now growing in the nursery grafted on the roots and also crown grafts on this crab apple. The crown graft apparently promises to be the more successful. This feature of the work will be taken up and prosecuted with greater vigor in the future.

Many attempts have been made to hybridize the cultivated varieties with pollen from the wild crab and vice versa, and there are some seedlings growing as a result of these crosses, but it is too early to state whether the experiment is a success or a failure. The young orchard will be given all possible care to demonstrate whether apples can be successfully grown here.

The rainfall is very heavy at Sitka as well as at many other places along the coast. The soil is therefore wet and sour, which makes it unsuited to the growth of apple trees. There are regions on the mainland, as, for instance, at Haines and Klukwan, where the rainfall is much lighter, the soil is better, and there is more sunshine. These conditions promise better results, and an effort will be made to carry out cooperative experiments in conjunction with some of the settlers at these points. It is true that the winters are also colder than those at Sitka, but if the wood has matured properly a temperature of 10° or 15° below zero should not be detrimental to the growing of hardy apple trees.

There are four varieties of sour cherries represented in this little orchard. They also bloomed profusely, like the apples. All the fruit dropped before maturity, and, as in the case of the apples, the cause has not been determined. The same is true of *Pyrus baccata*.

THE NURSERY.

A small nursery has been maintained for several years. It has been the practice to purchase seedling apple stocks from some of the Northern States, chiefly Minnesota and South Dakota, and to graft these, with the object of raising trees to be distributed and tested. While this plan will not be abandoned, greater use will hereafter be made of the native crab as a stock. The nursery comprises also bush fruits and basket willows. It has been fully demonstrated that raspberries, currants, including black currants, and gooseberries, can be grown with perhaps greater success in Alaska than they are grown below latitude 49° N., and certainly much better than they are

grown in the dry regions of the Middle West. There is perhaps no further need to test the adaptability of these bush fruits. The next step will be to improve the varieties, and efforts will be made in that direction. These bush fruits are propagated with the purpose of supplying them in small numbers to settlers scattered over the Territory and thus assisting them to get a start in useful and healthful fruits. Knowing that a few currant and raspberry bushes can be obtained free of charge at the experiment station, many people send here for them when they will not order them from nurseries in the States. There is also the probability that much of the stock would perish before it reached its destination when shipped from the States.

The nursery also contains some varieties of basket willows. They appear to do well. Most willows will grow in wet, peaty soil, and they are therefore well adapted to the coast region. They have been introduced in the hope that they may be useful alike to white and native people who will take the trouble to utilize them for basket weaving or for any other purpose for which they are adapted.

CLEARING LAND.

About an acre of land was cleared, chiefly in the winter of 1912-13, and seeded to oats as a first crop the past season. The oft-repeated experience was again confirmed. The first crop was a failure. The oats did not grow more than from 8 inches to a foot high. This is due to the sourness of the soil. A ton and a half of air-slaked lime was applied and worked into the surface before the seeding of the oats, but it was not enough. Continual working and fertilization, however, will eventually put this piece of ground in shape for culture. The expansion of the work calls for more and more land, and it will be necessary again to extend the clearing the coming season.

FAIRBANKS STATION.

As stated in former reports, this station is operated chiefly as a model farm to demonstrate what crops can be successfully grown in that region and how to grow them with the best results. Crops are generally grown on a field scale and not in small experimental plats. The station operates a self-binder, and a small thrashing machine and tread power were provided last year.

CROP RESULTS.

The season of 1913 was the most unfavorable since the beginning of experiments in the interior. Seeding began almost three weeks later than in 1912. A drought set in immediately after the grain

was seeded which delayed its growth abnormally, and in the latter part of August a cold wave swept over the country which sent the thermometer down to 25° F. and was accompanied by several inches of snow. This laid the grain flat and of course killed that which was not already ripe. Nevertheless, in spite of these adverse conditions, two varieties of spring wheat, Romanow and Red Fife, matured to such a degree that a good percentage can be used for seed. Four varieties of barley matured, and the best one of these proved to be one of the stations' hybrids. The early varieties of oats matured, and what is of particular interest, a plat of Kharkov winter wheat, a Russian variety which has now been perpetuated at the station for several years, ripened its grain. This wheat is not all that could be desired. It is not sufficiently hardy, but there is no doubt whatever that it can be improved by crossing to such a degree that it will be adapted to the climate. Two varieties of winter rye matured; both came through the winter with fair stands, developed good heads, and matured grain by August 4. A 25-acre field of Banner oats was caught by the late August freeze before the grain was far enough advanced to be used for seed. But Banner oats is a late variety not suited to the country. It was chosen because it is a vigorous grower, and for that reason it makes an excellent hay crop. It was sown for seed, but it was cut for hay instead.

POTATOES.

Potatoes have been grown for market to demonstrate that good potatoes can be grown in that country and that they can be grown at a handsome profit. When the writer visited the station in the early part of last August he was told by the keeper of the hotel where he lodged that he was using potatoes from the experiment station in his dining room and that they were better than potatoes shipped in from the outside. Later some of the merchants who had handled the station potatoes stated that their customers would ask for them and take them in preference to potatoes from the States.

An excellent frost-proof potato cellar was built by tunneling into a hill, and the bulk of the 1912 crop was kept there in perfect condition until August, when it was sold at wholesale for 4 cents a pound for marketable potatoes and 1 cent a pound for small potatoes, suited only for feed for hogs and other live stock. These prices were the lowest ever realized for potatoes in the interior, but, nevertheless, they paid a handsome profit over the cost of cultivation. Farmers and market gardeners about Fairbanks object strenuously to the growing of potatoes for market by the station. Partly to avoid competition and partly because the suitable ground was needed for other purposes, less than 3 acres were planted the past season.

THE COLD WAVE.

The cold wave which swept over the interior during the last few days of August was abnormal. It is not known to have occurred in that region of the country before, and it may not occur again in many years. It would be erroneous to measure the agricultural capacity of the country by this occurrence. But it is desired especially to call attention to the fact that in spite of this cold wave all the early varieties of grain matured. This emphasizes the statements that have frequently been made in these reports, that it is necessary to grow only early varieties, both of grains and vegetables, and that where these can not be had normally new varieties must be developed that are suitable to the country and climate. The experiment station has already developed early varieties of barley which are better, not only in point of earliness, but in stiffness of straw and size of head, than anything we have obtained from more southern latitudes. Cold waves and early fall frosts are liable to come, and the way to circumvent them is to grow early maturing grains and vegetables.

In 1912, on the other hand, there were no killing frosts, even in the interior, until the latter part of September. Potatoes were not killed at Fairbanks Station in that year until September 25, a circumstance which is also abnormal. Early fall frosts are useful in this experimental work in that they put the many varieties grown to a severe test and eliminate those that are not sufficiently early or hardy to withstand conditions. It is the law of the survival of the fittest in operation.

THE RABBIT PEST.

The rabbits did much damage to the crops. They have increased so rapidly of late years throughout the interior that they have become a serious pest. Whole fields of grain were eaten off as close as if they had been cut with a mower. There were literally thousands of them. One could not walk along the fields, especially near the edge of the timber, without encountering them by the score. Several farmers in the Fairbanks district lost the greater part of their crops from this pest, and the experiment station also suffered severely. Nothing could be done to abate the nuisance except to build rabbit-proof fences around the fields, which would be out of the question on account of the expense. The country is too large and the settlers too few to make it practicable to make war on them, even by concerted action; and the timber and bushes afford hiding places for them which would frustrate attempts at rabbit drives.

But nature will provide a remedy. Many of them were apparently afflicted with some contagious disease which killed off great numbers, and it is thought that they will not be so numerous next year.

CLEARING LAND.

Ten acres of the heavier timbered land at the station was partly cleared the past season, and some 20 acres more between the wagon road and the railroad has been slashed preparatory to clearing. It is planned to continue the clearing on the south-sloping birch land as fast as the means in hand will permit. This heavily timbered land is more expensive to clear than that which slopes to the north, but the soil is so much better that it is the most economical plan in the long run.

PLANS FOR NEXT YEAR.

It is planned to continue growing potatoes of many kinds for the purpose of selecting and recommending those that prove to be best adapted to the climate and soil, and also to grow some potatoes for market, but on a smaller scale than during the past two years. As it is not desirable to enter into competition with the farmers for the products that they find marketable, it is planned to introduce hogs at Fairbanks Station and to breed them for sale to farmers for breeding purposes. The writer has selected the Duroc-Jersey as perhaps on the whole the breed best suited to the country, and they will be kept pure; that is to say, no scrubs or mongrels will be bred on the place. This experiment will be begun on a small scale and gradually increased until the herd is as large as it will be economical to handle. It is planned to raise potatoes for their feed to a large extent and also to provide alfalfa pasture for them. The potato growing will be in rotation with grain. It is expected that the cultivation which the potato crop requires will be almost equal to a summer fallow, so that while potatoes follow grain, grain will again follow potatoes for a portion of the farm, while another portion will be seeded to some leguminous crop which will be followed by potatoes, and potatoes by grain. It is expected that the fields sloping to the north can by this plan be made to maintain their fertility and produce a crop of some sort every year.

Aside from the hog feed produced and the effect on the soil equivalent to summer fallowing, the intervening potato crop will effectually kill out volunteer grain, which is a nuisance. It is planned to devote more space to seed growing. The crossbred and hybrid grains which are originated at Rampart Station can be tested on a larger scale at Fairbanks, and the desirable sorts propagated for sale and dissemination. Alaska should not long be dependent on the outside

for seed grain. It is hoped to reverse the process and produce seed that shall be in demand in the States. Alfalfa growing will be attempted on a fairly large scale as soon as seeds of hardy strains of alfalfa are available.

Experiments with the yak are considered desirable and when introduced they will be placed at this station together with a few head of Galloway cattle for use in crossbreeding experiments.

RAMPART STATION.

The success at Rampart Station has been almost phenomenal. There has never been a failure of more than a few late-maturing crops at that station, and even last year, with the severe freeze already referred to, all the important crops matured.

ALFALFA GROWING.

The most important step to report this year is the fact that seed was matured on two species of alfalfa, namely, on a hardy strain of Grimm alfalfa, which is a variety of *Medicago sativa*, and also on the yellow-flowered Siberian alfalfa, *M. falcata*. This accomplishment is of the greatest possible significance, for if hardy varieties of this valuable agricultural plant can be perpetuated by producing Alaska-grown seed, then alfalfa growing can probably be extended throughout other agricultural regions of the interior. This means that the Alaska farmer in suitable regions can produce this nutritious hay and that he can raise live stock to the extent of his needs. It means, further, that the fertility of the soil can be maintained and increased. Alfalfa, in common with other legumes, is a gatherer of nitrogen from the air, and since nitrogen, of all the elements of plant food, is the one that is most readily exhausted and the costliest to replace if it must be purchased in the form of fertilizers, the fact that a crop can be grown which enriches the soil in this element is a matter of great economic value.

This is the first time that the small plats of alfalfa have produced seed. It took two years for the plants to become thoroughly established. The test was unusually severe; indeed, so severe that if seed could mature the past season there is little probability that it will fail in any season. Part of the seed had been matured and was gathered before the severe freeze in the latter part of August, but the bulk of the seed was not gathered until the freeze was over, and it was therefore exposed to the full force of the cold wave. Germination tests have proved that this seed was but slightly, if at all, injured by the frost. Alfalfa growing for the production of seed will be extended, and experiments with the several varieties and species now under cultivation, as well as the new strains which can be obtained from time to time, will be continued and extended.

There are at present 14 species and varieties of alfalfa growing at the station. Nitrogen-fixing bacteria have been established on the roots of some of this alfalfa. They will be nurtured and spread to all the plats. (See illustrations of seed-bearing branches of Grimm and Siberian (*M. falcata*) alfalfas. Pl. VI, figs. 1 and 2, p. 32.)

TRIFOLIUM LUPINASTER.

Another legume of possible value to Alaska is the lupinaster, a small patch of which produced seed the past season. The seed was all ripe the first week in August, and this being the case, there is no question about its ability to perpetuate itself. It is a coarse-looking plant, with stiff, more or less upright stems, rather large leaves, and red blossoms in heads, not unlike those of red clover in appearance. The leafage is scant, and the plant is straggling and does not produce a dense growth. It is not likely that it will succeed in competition with alfalfa, but it is possible that it may be of value in the far north, where the season is too short for alfalfa seed to mature.

HYBRIDIZING GRAINS.

Several crosses have been made between varieties of wheat, oats, and barley, but what the result of the past season's crosses will be can not be learned until the end of next season. Some valuable crosses have been obtained among varieties of barley. This is destined to become a leading crop in interior Alaska. It will of necessity be largely used as a feed for live stock and for hay. For this purpose a bearded barley, as is well known, is objectionable. An early barley, with stiff straw, is also desired, and there have been produced crosses which possess these qualities to a large extent. It is not believed that the highest attainable degree of excellence has been reached, and the work will therefore continue; but greater emphasis will hereafter be laid on producing early and productive varieties of wheat and oats.

There were grown at the station the past season 42 hybrid barleys of our own production and, in addition, 22 strains and selections from varieties obtained from other sources. One of the hybrids matured in 69 days, another in 71 days, and still others in 76 days, exclusive of the dates of seeding and harvesting.

GRAIN-BREEDING HOUSE NEEDED.

This work is handicapped by the lack of a grain-breeding house. The period during which the crossing can be done, namely, while the grains are in flower, is very short. They nearly all bloom at the same time, and since no skilled assistance aside from the superintendent in charge is available, the number of crosses made has

been limited. A breeding house could be used to extend the season, and the late seedlings might still mature under the protection of the house long after the grains outside had been killed by frost. (See Pl. VIII, fig. 1, p. 48.)

GROWING SEED.

In the summer of 1913, 28 or 30 pounds of turnip seed was grown at Rampart Station from selected roots. In plumpness and appearance this seed is better than the average of commercial turnip seed. Nowhere on earth are better turnips grown than in Alaska, and it is a well-known fact that northern-grown seed of nearly all kinds of vegetables has greater vitality and produces better crops than southern-grown seed. This successful experiment therefore opens up a vista of possible seed farms which may in the future be located in various regions of the interior. The seed should find a ready market in the States.

And this is true not only of turnip seed. Several varieties of garden peas have been perpetuated for a number of years at Rampart Station by home-grown seed. By permitting the earliest pods to mature it is possible for anyone to grow pea seed successfully, as is done at the station. This question of seed production is of vital importance. The experiments in this line will not only be continued but extended to the limit that circumstances will permit.

SMOOTH BROME GRASS.

The value of this grass (*Bromus inermis*) has been mentioned in former reports, but it is worth referring to again. There is a patch of about an acre which has now survived three winters without suffering or dying out in the slightest degree. It forms a dense sod and yields a good crop of hay each summer. It is always the first grass to afford pasture in the spring and, all things considered, it is perhaps the best grass both for meadow and pasturage that has so far been tested.

IMPROVEMENTS.

Gradual progress is being made in extending the clearing. About 5 acres were thus cleared and made ready for the plow the past summer. Because of the high cost of labor, which at present is \$6 per day, the clearing is not progressing as fast as is desirable, but a few acres will be cleared each season. A few suggestions on this subject are offered to the homesteaders who doubtless in the near future will engage in clearing land and building homes in Alaska. Fire is the cheapest agent that can be employed in clearing land, and the month of June is usually the driest season during the summer in the interior. Arrangements should therefore be made to burn over the

ground intended to be cleared early in June. Except for small garden patches it is too expensive to attempt to cut off the layer of moss by hand, but the drying out of the moss can be much facilitated by cutting the timber and brush during the winter so that the air and sun can get at the soil. If the ground that it is intended to clear does not get dry enough to burn over one year, wait until the next year and try it again.

It is not advisable to attempt to plow the moss under. It takes a long time to rot, and it produces a sour, unsatisfactory soil. It has been found advantageous to loosen the moss with a plow from which the moldboard and land side were removed, so as to leave only the coulter, and better still, a special tool for the purpose can be made in the form of a heavy, narrow cultivator tooth and put in place of the coulter. It will rip up the moss and the surface roots and thus facilitate the drying preparatory to burning.

For the removal of stumps any good, small-size stump puller which can be operated with one horse will do the work. Such machines are in use both at the Rampart and the Fairbanks stations.

Another important point in managing the land is to plow it thoroughly and deep in the fall. It should then be left rough all winter. This enlarges the surface exposed to the effects of weathering. The snow water can more easily be drained off in the spring, thus facilitating early seeding, and the porous soil holds moisture well—an important fact if the early summer is dry, as is often the case.

THE WATER QUESTION.

It has been a somewhat serious problem to obtain water for the stock in the winter at Rampart. In the summer time the horses go to the river, more than a quarter of a mile away, to drink, but in the winter, when everything is frozen up and the ice on the river is 6 or 7 feet thick, it is not an easy matter to secure water from this source. The only other means of obtaining water is to melt snow or ice on the stove in the house. This answers for household purposes, but it is not practicable to supply the live stock in this way. To remedy this it is planned to build a cistern under the barn and to fill it with rain water from the roof during the summer. To hold enough water such a cistern should be at least 10 feet deep and 10 feet in diameter. Several plans are considered. One is to sink a wooden tank in the earth; another is to use a galvanized-iron tank in a similar manner; and a third is to build a cement cistern. This would be the simplest plan, but the walls and the bottom would be more liable to damage from freezing than either the wood or iron. In any case this reservoir must be thoroughly covered so as to be practically frost-free.

KODIAK STATION.

The work of reclaiming the station from the choking influence of the volcanic ash was continued throughout the summer with gratifying results. There is now scarcely a doubt that when vegetation is reestablished there will be a better soil to work with and the pastures will be better than ever before. The volcanic ash is totally devoid of nitrogen, and this element must be supplied before vegetation can be restored, but wherever it is supplied grasses and silage crops are doing well. The old sod of native grasses which was covered up is, of course, rich in nitrogen, and it was found that wherever the plowing was deep enough to turn up from 1 to 3 or 4 inches of soil so as to mix it with the ashes, grasses and grains did better than they did on the old sod or than they do on the bare ashes. The problem is then to find a tool, a sort of subsoil plow, which will reach into the surface of the old sod.

On the slopes and hillsides the ashes have largely disappeared. In wet weather the rain washes them down to the lower levels, and in dry weather the winds blow them off, to be deposited elsewhere, as in the case of light drifting sands, only these ashes are lighter and finer and blow about more readily than any sort of drift sand. The net result of the operations of nature, therefore, is that the native vegetation has been so far uncovered on the steeper slopes and hillsides as to be fully reestablished, and the ashes are in a measure stimulating the growth in these places so that the pasture is better than ever, while on the lowlands and level areas the ashes have settled to a depth of from 8 to 16 inches, and more in places. The low places have been filled up, and hummocks and irregularities of the surface have in a large measure disappeared, so that the land can now be cultivated and seeded, which was impracticable before the ashes fell by reason of the tangle of roots, small bushes, and dead grass. It is now possible to establish clovers and cultivated grasses, which was not possible before without at least first clearing, leveling, and breaking the surface at the expenditure of much labor and money. Thirty tons of Norwegian nitrate of lime were bought last spring to be applied to the ashes, at a cost of \$43 per ton in Seattle, and it has proved a valuable fertilizer. It is very readily soluble, and it is therefore best applied as a top dressing after the grass seed and grains have germinated. But it is also necessary to sow a little with the seed so that plant food may be available as soon as the plants start to grow.

The ashes are of course totally devoid of humus, and the fact that the mixture of old soil with the ashes proves beneficial is probably due in a measure to the physical improvement of the ashes as a plant bed by the addition of humus.

It was found that old stable manure worked into the ashes at the rate of some 15 tons to the acre is a very efficient fertilizer. This is illustrated in some of the photographs submitted.

The problem therefore stands as follows: The hillsides can take care of themselves. Their native pasturage is restored. It would not have been practicable to break it up and introduce cultivated grasses and legumes in these places anyway. In the bottom lands and other level ground cultivated grasses and clovers are being introduced as a first crop. Used partly as a nurse crop for the grasses, oats are grown, which are cut green and used for hay if the weather permits curing, or for silage if curing of hay is impracticable.

The following grasses and clovers were seeded, first in small plats and individually for a comparative test, and secondly in mixtures and over large areas: Sheep fescue, creeping bent grass, tall meadow oat grass, redtop, timothy, smooth brome grass, rye grass, Kentucky bluegrass, red fescue, meadow fescue, red clover, alsike clover, white clover, spring vetch, and rape.

Of these, the following apparently did the best in the ashes, and they will be seeded next spring on a larger scale: Creeping bent grass, meadow fescue, redtop, timothy, white clover, and alsike clover.

An effort will be made to establish white clover as a thin undergrowth all over the pastures, because of its nitrifying influence on the ash.

It is planned to seed 100 acres to oats to furnish hay and silage for the herd during the winter of 1914-15, and to seed the same area with a mixture of grass and clover. It is confidently expected that from this enough feed can be raised to winter the herd.

SALE OF SURPLUS STOCK.

The herd of Galloway cattle increased beyond the needs of the station. A selection was therefore made of those animals which came nearest the ideal type that is sought, and the surplus was sold off, partly at private sale, but chiefly at public auction, held December 22 at Chehalis, Wash., where the herd is wintered. As has been explained in former reports, the object is to develop a dairy type of Galloway. As a breed, the Galloways give rich milk, but they give it in small quantities. There is a wide difference, however, in the milking qualities of these cattle. The plan is to select the best milkers to breed from and thus eventually, not only raise the milking qualities of this herd, but establish a type of Galloway cattle suited for dairying. The Alaska settlers need an all-purpose cow—a cow that will give a fair quantity of milk as well as produce good beef. The Galloway is better adapted to the climate than any other known

breed, and, if a milking type can be established, it will be an ideal cow for the Territory, especially for the coast region. That this can be done is beyond question. It is merely a matter of time.

THE DAIRY.

In order to work out this question it is planned to operate a dairy at the village of Kodiak. It would have been in full operation by this time if it had not been for the interruption caused by the outbreak of the volcano. The buildings are almost ready and will be completed with the laying of a cement floor and the building of stanchions in the dairy barn.

THE RETURN OF THE HERD.

The herd, which has been wintered at Chehalis, Wash., will be returned to Kodiak the coming summer, and the cows selected for the purpose will be placed in the dairy at Kodiak. The remainder of the herd will be kept at Kalsin Bay, 15 miles from the village.

THE SHEEP.

The flock of sheep which has been maintained at the station for some four years suffered much from the fall of volcanic ash. Twenty-five head were lost as the direct or indirect result of this disaster. The loss included two very fine rams, purchased for the purpose of breeding up the flock. In the fall of 1912 another ram was purchased to replace those lost, and the breeding has progressed satisfactorily. The breeding flock has not increased, however, as fast as one could wish, for the reason that a large proportion of the lambs were males and are eventually sold as wethers; the old ewes also are worked off for mutton. There are at this writing 61 head in the flock, all told.

NEEDS OF THE STATION.

In order to conduct the work economically and efficiently, additional equipment must be provided in the near future. Among the more expensive items is an ensilage cutter and a gasoline engine to run it. Oats put in the silo whole do not keep well because they can not be packed close enough, and there is consequently great loss at the top and sides of the silo. This would be remedied by using a cutter.

A larger and safer launch is needed. Since part of the herd is at Kodiak and part at Kalsin Bay, there is of necessity much travel back and forth over a boisterous arm of the sea. The little launch

now owned by the station is only 22 feet long and is wholly unsuited to rough weather. A launch about 45 or 50 feet long should be procured, and authority is desired to purchase a hull of that size. The 12-horsepower standard gas engine now in the small launch would furnish power enough for the larger craft.

The less expensive equipment needed at once consists of a hay loader, a side-delivery rake, a gang plow with a subsoiling attachment and a surface packer, and either a gasoline engine or a windmill to operate a pump at the dairy barn.

Three buildings are also needed for the station force—a cottage for the superintendent, a cottage for the dairyman, and an addition to the cottage at Kalsin Bay, so that the help that must be kept there can be accommodated; but these buildings can not be provided at once. The machinery, implements, and launch must come first.

REPORT OF WORK AT FAIRBANKS STATION.

By J. W. NEAL, *Superintendent.*

THE WEATHER.

In view of the dominating influence of the weather over crop results, as well as of the constant inquiry about the weather of previous years, it is considered desirable to include in this report a short review of weather conditions at this station during each year since the beginning of field work in 1908.

The season of 1913 opened several days later than that of 1912. The last snow left the south-slope fields on May 6 and a week later left the north-slope fields. Seeding began on May 19. The weather continued dry and cold through May, very dry and hot through June and until July 19, when a copious rain cooled the atmosphere and stimulated plant growth. During the greater part of June and much of July the atmosphere was filled with haze or smoke, which proved very detrimental to some crops, especially potatoes. From July 19 the weather continued wet, with little sunshine, until September. There was a light killing frost on August 14, which damaged corn, beans, and buckwheat. From August 27 to 30 a cold wave swept over the country, carrying with it a snowstorm without precedent within the knowledge of the earliest settlers. About 4 inches of snow fell at the station, while in the neighboring hills there was a fall of some 2 feet, which did not entirely leave the high ridges. Prospectors reported that from 4 to 5 feet of new snow fell in the mountains during the last week of August.

During this storm the temperature at the station fell to 26° F. on the night of August 27, with all the vegetation covered with wet snow. The records for August 28, 29, and 30 show respective temperatures of 26°, 25°, and 30° F. This storm killed the potatoes

all over the valley and practically ruined the grain crops that had not already matured, so that they had to be cut for hay.

The month of September was dry and quite favorable for curing the hay crop. One and a half inches of snow fell on September 28, but soon left the fields. Light freezing weather prevailed more or less thereafter, but plowing could be continued until October 9, when hard freezing weather set in.

During the five months from May 1, which covers somewhat more than the actual growing season, there were 53 clear days and 39 partly cloudy days. The extreme temperatures for the five months, respectively, were as follows: May, 75° and 17°; June, 88° and 42°; July, 83° and 39°; August, 76° and 25°; September, 66° and 20° F., with a monthly rainfall, respectively, of 0.49, 0.44, 2.25, 3.70, and 0.51 inches, totaling 7.39 inches for the five months.

The snowfall for 1913 up to November 1 was 35 inches, making 2.25 inches of moisture. The rainfall in October was 0.26 inch.

In 1912 seeding began on May 1, which is many days earlier than for any other year since the station was established. The early summer was warm and dry, while the latter half of the season was cold and cloudy, there being practically no sunshine after the month of June. The atmosphere continued very smoky all summer after the volcanic eruptions on the coast early in June, and what little sunshine there was had little effect on the growing crops.

A light frost occurred on June 8 and another on August 21, followed by several light killing frosts in the lowlands, doing more or less damage to crops. Potatoes at the station were killed by frost on September 25, 1912, almost a month later than in 1913.

During the five summer months of 1912 there were 22 clear days and 51 partly cloudy days, with extreme temperatures as follows: May, 76° and 26°; June, 84° and 31°; July, 85° and 40°; August, 78° and 31°; September, 64° and 28° F., with monthly rainfalls of 1.22, 3.15, 0.96, 0.82, and 1.16 inches, totaling 7.31 inches. The snowfall for 1912 was 40 inches, adding 2.89 inches of moisture. There was very little freezing weather until after the middle of October, and plowing could be continued until October 20.

In 1911 the season opened a little later than usual. Seeding began on May 16, although much of the ground could not be seeded until two weeks later. The weather continued wet and cold until June, when warm, dry weather ensued, continuing until far into August. Then cold, rainy weather set in, making it very difficult to cure the crops. On August 31 potatoes and other tender plants were killed all over the valley. The temperature fell to 28° F. at the station on that date, while 20° F. was recorded in the lowlands. Nearly all of September passed with little or no frost, and the ground did not freeze sufficiently to stop plowing until October 20.

During the five summer months of 1911 there were 51 clear days and 40 partly cloudy days, with the following respective extreme temperatures: May, 59° and 26°; June, 82° and 31°; July 84° and 36°; August 85° and 28°; September, 80° and 22° F., and a respective monthly rainfall of 0.16, 0.00, 2.16, 2.30, and 1.60 inches, totaling 6.22 inches. The snowfall for 1911 was about 27 inches, adding 1.92 inches of moisture.

In 1910 seeding started on May 16. The season was quite favorable to growing crops during the early summer, while the latter half was cold and dry for the most part, with several killing frosts during August. Potatoes were killed on August 29 at the station, but portions of the crop on higher ground were not killed until September 18.

During the five summer months of 1910 there were 64 clear days and 45 partly cloudy days. The respective extreme temperatures were as follows: May, 76° and 24°; June, 86° and 35°; July, 86° and 36°; August, 76° and 30°; September, 78° and 12° F., with a monthly rainfall, respectively, of 0.39, 2.16, 0.46, 1.69, and 1.91 inches, totaling 6.61 inches for the five months. The snowfall was about 40 inches, adding 2.84 inches of moisture.

The early summer of 1909 was very dry. Seeding began on May 22. Much of the seed did not germinate until after a rainfall late in June, which was too late for the grain to mature. Seeds that started early came to maturity. Potatoes were slightly frosted August 25, but were not killed until September 16.

During the five summer months of 1909 there were 77 clear days and 53 partly cloudy days. The respective extreme temperatures were as follows: May, 74° and 26°; June, 77° and 35°; July, 82° and 42°; August 76° and 28°; September 74° and 11° F., and the respective monthly rainfall was 0.38, 1.64, 1.90, 1.78, and 3.90 inches, totaling 9.60 inches for the five months. The snowfall was about 54 inches, adding 3.76 inches of moisture.

The season of 1908 opened very late and continued cold, with showery weather, all through May. Very little soil was in condition to work when seeding started on May 26. The remainder of the summer was too dry for the crops. Nineteen hundred and seven was an unusually wet year, which left the ground very wet for a beginning in 1908. With a wet spring and an exceptionally dry summer 1908 was the most unfavorable year during the life of the station.

For the five summer months there were 68 clear days and 59 partly cloudy days. The respective extreme temperatures were as follows: May, 74° and 30°; June, 83° and 35°; July, 79° and 40°; August, 80° and 31°; September, 64° and 15° F., and the monthly rainfall, respectively, 0.52, 0.96, 0.73, 0.71, and 1.57 inches, totaling 4.49 inches for the five months.

The station has not a complete record of the snowfall for 1908, but it was not materially different from that of the year following.

SUMMARY OF THE WORK FOR THE SEASON.

The work at this station was continued in accordance with plans set forth in former reports. Two acres of south-slope land that had been partly cleared in the fall of 1912 were finished, broken up, and seeded this spring to barley and oats. Forty acres were seeded to grain in several varieties, with a view to maturing a large quantity of seed. About $2\frac{1}{2}$ acres were seeded to some 20 varieties of potatoes. Ten acres of heavy timber land were cleared of the timber, the stumps pulled from 8 acres, and about half of the whole tract cleared of the stumps and roots ready for the plow; but time did not permit of the breaking of the new ground before winter. Thirty-five acres of grain land were summer plowed after the crops were removed.

A small ice room and woodshed combined has been built since the last report was made, and the hay barn, started in 1912, has been finished, with sheds on either side 13 by 40 feet. Some fencing was done to inclose new ground.

A small thrasher outfit, with a one-horse level-tread power, was added to the station equipment.

GRAIN CROPS.

As already stated in this report, about 40 acres of grain, including a number of varieties, was seeded with a view to ripening it all for seed; but the season proved unusual in the extreme, which defeated the plan in large measure. Several of the small fields matured, however, and the station will probably have seed enough for home use next year. About 7,000 pounds of seed were ripened and thrashed from the 1912 crop, and much more could have been ripened had it not been cut for hay.

The crops this year were much damaged by the cold wave and snowstorm during the last week in August, the severity of which has already been indicated (p. 24). The first half of the growing season was so dry that any seeds not well covered did not germinate until after rain fell on July 19. Most of the grain was drilled in, and therefore a very fair stand was obtained. Growth was considerably checked, however, by the long-continued dry weather that prevailed.

The small-plot work was practically abandoned for the year. Hence this report will deal with the more general field work. Since the new thrasher, referred to on page 13, did not arrive in time to be assembled before the winter set in, no thrashing has been done be-

fore the writing of this report. Therefore, no safe estimate of the crop yield in seed can be included herein.

Seeding began on May 19 and continued to May 27, comprising the following varieties: One acre of Romanow spring wheat, 1 acre of Red Fife spring wheat, one-half acre of hull-less barley No. 19851, 1 acre of beardless barley No. 19852, 1 acre of Sixty-Day oats, 11 acres of Finnish Black oats, and about 25 acres of Banner oats; also a small plat each of Gray Maryle barley and a hybrid barley known as No. 4a-1, Chittyna crossed on Oderbrucker. All of the seedings mentioned were from station-grown seed ripened in 1912 except the small plats of Gray Maryle and hybrid barleys.

The Romanow and Red Fife wheats seeded on May 19 made an excellent crop despite the prolonged dry weather, and were almost ripe when the cold wave of August 27 to 30 came (Pl. III, fig. 1). Both plats were laid flat by this storm. Much of the Romanow had already lodged, owing to succeeding showers during August. This variety was quite ripe enough for seed when the killing frost of August 28 came, but rainy weather had prevented its harvesting. The grain was a little soft, and it is a little shrunken from the freezing, while the Red Fife is considerably shrunken. The latter variety began heading just 38 days after seeding, and while the Romanow began heading 3 days later it had advanced toward maturity more than the Red Fife by several days. The Romanow plat made a crop of fully 3 tons, while the Red Fife made probably half a ton less.

The seeds of the above varieties were tested for germination, and it was found that 90 per cent of the Romanow started growth, while only 78 seeds out of the 100 of the Red Fife variety started; but probably a greater percentage of either variety would grow under natural conditions.

Hull-less barley No. 19851, seeded May 19, started heading June 25, was in full head by July 4, and ripened August 15, 88 days from seeding. It made a good stand, but proved to be poorly resistant to drought, the growth being short and with very small heads. The upper glumes of many heads all over the plat did not fill.

Beardless barley No. 19852, seeded May 25, on new ground of the first breaking. The seed bed was quite rough, and the drill did not cover all the seed. It therefore made rather a poor stand and fireweed came up thickly on account of the thin stand and the new ground. The growth was of good height and it made good heads; however, the upper glumes on some heads did not fill. The first heads appeared June 30, and it was in full head by July 8. The grain had matured by August 25, 92 days from seeding (Pl. III, fig. 2).

Gray Maryle barley, a hull-less variety, was seeded May 25, was in full head July 1, and ripened by August 15, 82 days from seeding. The stand was good, and the growth averaged about 30 inches high. The upper half of the ears over a very large portion of this plat did not fill, indicating less drought resistance than other varieties grown this year.

Hybrid barley No. 4a-1, Chittyna×Oderbrucker: Seed received from Rampart Station on June 5 was seeded at once. The first heads appeared July 11, and it was fully headed by July 20. It made an excellent growth, averaging 48 to 50 inches in height. The heads were of good size and well filled; probably one-half of 1 per cent of the heads carried beards. With the late seeding and a most unfavorable year for ripening grain, this barley was almost ripe enough to harvest when the killing frost and snowstorm swept over the country in August. The crop had lodged badly, and the snowstorm laid it flat. It was immediately taken up with a reap hook and set in a shed to dry for seed.

The freeze caused the grain to shrivel badly. It is just now being tested, and a fair percentage of the quantity tested has already germinated.

This is a very promising beardless barley for a fodder crop, as it will produce a heavy yield in straw and is quick maturing, which is a very important factor in curing hay.

Finnish Black oats seeded May 21, showed the first heads on July 1, and were in full head about July 10. They ripened by August 25, 98 days from seeding. This is a very tall-growing oat, but the soil on this plat was too dry this year for the grain to make a fair showing. The same variety on the same soil in 1912 made an enormous crop. (Pl. IV, fig. 1.)

Another plat of 10 acres, seeded a week later on the south slope of another ridge near the north line of the station, on new ground, made an excellent growth, and the yield would have been large, but the countless numbers of rabbits collecting around the back field practically ate up the crop before harvest time.

Sixty-Day oats seeded May 25 showed the first heads about June 30. They had fully headed by July 8, and ripened about August 25, 92 days after seeding. This seeding was on new ground similar to that seeded to Beardless barley No. 19852. It also made a thin stand, for like reasons, and because quite weedy. The growth was about normal in length of straw. It is probably the earliest variety of oats ever grown here. It does not yield as abundantly as some other varieties, but with its earliness to mature, and fine straw, it is a desirable variety for the forage crop. Its quick maturing brings the hay harvest early in the season when it is less difficult to cure hay.

A 25-acre field was seeded to Banner oats on May 22 to 24. They began heading by July 4, and were about all headed by July 15. This entire field was intended for thrashing and doubtless would have ripened under usual conditions. (Pl. IV, fig. 2.) The major portion of the crop was nearly ripe enough to harvest when the killing frost and snowstorm came late in August. The crop was cut with the self-binder and cured in the sheaf for hay. Much of the seed will grow, as proved by testing it, but not a sufficient percentage to warrant thrashing it for that purpose. However, some of the ripest bundles will be picked out and thrashed for seed, and by sowing it rather thickly a good stand can be obtained. This will be necessary, as all the Banner seed on hand was sown for the above crop. One acre of this field, which had been planted to potatoes for the three previous seasons, made a crop of about double that of adjoining ground, indicating some value in crop rotation; however, there is reason to believe the large yield was due to the cultivation rather than to crop rotation.

A patch of volunteer buckwheat was blooming by June 20. Considerable seed was ripe by August 14, when the crop was killed by frost. (Pl. V, fig. 1.) Two plats of buckwheat ripened some seed in 1912, and volunteer stalks kept coming up all over several acres near by during the early summer, and had to be hoed out of the cultivated crops.

Oats and barley volunteer so much that they often become very annoying in cultivated crops that follow grain, or when an effort is being made to maintain a clean variety of grain for seed.

Strange as it may seem, and contrary to usual conditions, late seedings this year made from 25 to 40 per cent more straw than the early seedings, but only the earliest seedings matured seed. This may be accounted for by the dry, hot weather of the early summer stunting the growth of the early crops, while later seedings came up after the soil was becoming dry, making them more drought resistant.

WINTER GRAINS.

Kharkov winter wheat, seeded August 3, 1912, survived the winter better than in former years. It made about a two-thirds crop. The growth was 24 to 30 inches tall, with good-sized heads, well filled. The heading period covered from June 12 to 20, and it ripened about August 4, some days earlier than in previous years, which was probably due to the extremely dry summer weather hastening maturity.

Winter Rye, No. 19556, seeded on August 3, 1912, survived the winter with probably a three-fourths crop, such as might be expected in a milder climate. The heading period covered from June 7 to 15, and the grain ripened by August 4. (Pl. V, fig. 2.) The

crop made a growth about as tall as the average man. The heads are long and well filled.

Another variety, known as "Fall Rye," was seeded August 3, 1912, was heading from June 7 to 15, and ripened by August 3, 1913. The stand, growth, and yield were not materially different from the last-named variety, although preference might justly be given to the No. 19556 variety.

Several varieties of winter wheat and rye were seeded this year on July 25, and still others on August 2.

Fall seeding has been done a little earlier each year with increasingly good results. The several plats seeded this year on July 25 made a very fair growth before winter set in, but a few days' earlier seeding would have been better. From these and previous observations the writer would advise seeding fall grains usually about the third week in July.

The entire grain crop for 1913 was probably 25 tons in the straw. The crop was cut short by the unusually dry weather of the early summer, which continued well into the season. The crop yield was also reduced by 10 to 15 tons on account of the rabbit invasion of the country. During the early part of the summer the rabbits multiplied very rapidly and collected about the borders of the fields, feeding on the young grain about the edges as fast as it came up, eating off a strip from 100 to 300 feet in width. Later in the season, when the grain headed, they invaded the fields in large numbers, cutting down the stalks, eating only the heads, and leaving the ground covered with the straw. As the crop of young rabbits increased in size the destruction increased in proportion, until the grain was harvested. It was not uncommon to see blocks of a half-acre in the midst of a 40-acre field cut down as clean as a mower could do it. One 5-acre block of oats, with timber or brush on three sides, was entirely destroyed, and the destruction continued even after harvest, until the crops could be cured and stored. One farmer reports that he sowed 40 bushels of oats on 15 acres and that he got one load of hay. This field was out in the hills, nearly surrounded by timber; and, but for the rabbits, the owner expected to harvest 20 tons of hay. The farmers close to town did not suffer much damage.

At the station the fall seeding had to be fenced with poultry wire netting. If these rabbits do not die off during the winter, they will be a great menace to the farmers another year, and there will be little use in seeding grain not inclosed with rabbit-proof fences.

LEGUMES.

Plats of alfalfa and red clover were seeded on June 2 with a hand drill. The soil had become so dry that much of the seed did not

germinate until late in the summer, making a very uneven stand. The alfalfa was cut early in August and made rather a light growth during the remainder of the summer. The clover was left uncut, and by fall it made a thick stand 18 to 20 inches high. It began to blossom July 20. This growth was left as a cover crop for the winter, but the rabbits had practically cleaned it up before any snow fell, and they are still digging at both the clover and the alfalfa through the snow.

A small plat of common alfalfa, seeded in 1912, survived the winter, making a good stand. It was cut twice this season, but the crops were light, owing to the extremely dry weather and the lack of facilities for irrigation. The fall growth is entirely eaten off by the rabbits, along with every vestige of green about the premises. Some very large horse-radish stalks were entirely eaten up.

Several packages of alfalfa plants were received from Sitka Station on August 1, and were immediately set out in well-prepared soil. These plants were a long time on the way, and only a small percentage of them made a start. These did not make much growth, as the season was well advanced and unfavorable weather conditions soon followed. It is doubtful if any of these plants will survive the winter. The varieties received were Obb, Omsk, and Irkutsk.

THE POTATO CROP.

The season of 1913 was an off year for the potato crop as well as for other lines of farming. Reports are coming in from all over the valley to the effect that the average yield throughout the country was about one-third that of last year, and the vines were killed so early that the tubers are lacking in quality as compared with the crop of last year. It should be stated, however, that the crop of 1912 was a banner crop both in yield and quality.

Contrary to the experience of previous years, level cultivation gave a better yield than ridging. This was doubtless on account of the protracted period of dry weather. During the dry weather the atmospheric conditions seemed to check the growth of the vines entirely, for they made no perceptible growth for several weeks, while the atmosphere was filled with a haze or smoke which often almost hid the sun from view.

After the rain on July 19 showery weather continued, which cleared the atmosphere of the haze; the potato vines soon covered the ground, making marvelous growth. The drought no doubt checked the plant growth to some extent, but the soil about the roots seemed moist enough at all times for at least a fair growth to continue.

It can be emphasized that potatoes should always be sprouted before planting in Alaska, as has been shown in former reports. Some



FIG. 1.—SPRING WHEATS, FAIRBANKS STATION, 1912. RED FIFE AT LEFT, ROMANOW AT RIGHT.



FIG. 2.—HYBRID BARLEY, FAIRBANKS STATION. ORIGINATED AT RAMPART STATION.



FIG. 1.—FINNISH BLACK OATS, FAIRBANKS STATION, 1912.



FIG. 2.—HARVESTING OATS, FAIRBANKS STATION, 1912.

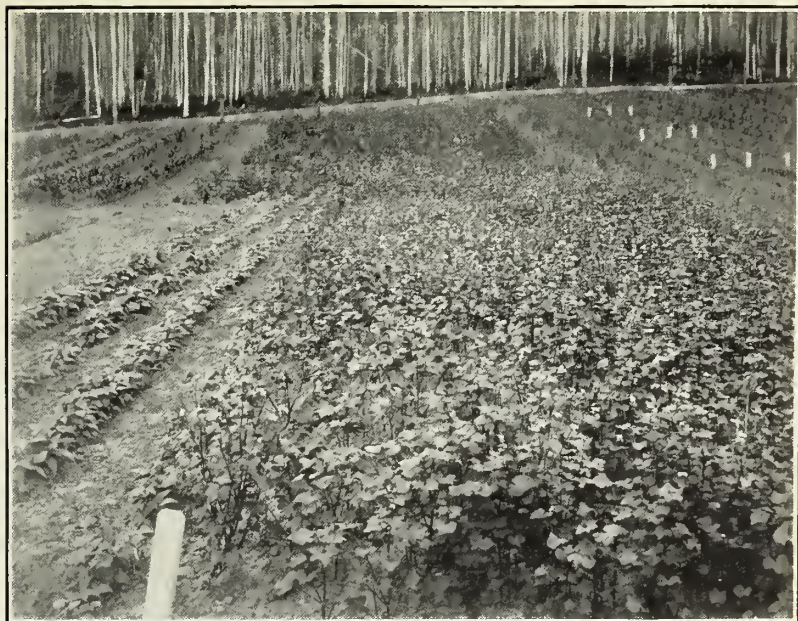


FIG. 1.—VOLUNTEER BUCKWHEAT (BEANS AT LEFT), FAIRBANKS STATION.



FIG. 2.—WINTER RYE MATURED, FAIRBANKS STATION.



FIG. 1.—GRIMM ALFALFA SHOWING SEED PODS.



FIG. 2.—SIBERIAN ALFALFA SHOWING SEED PODS.

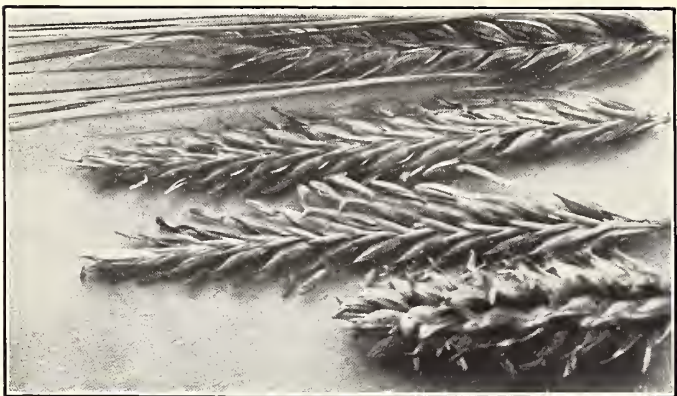


FIG. 3.—HYBRID BARLEYS, PARENT PLANTS AT LEFT AND RIGHT.

RESULTS OF SOME PLANT BREEDING WORK AT RAMPART STATION.

of the most successful growers here start their seeds in crates, covering each row of tubers with earth until the crate is filled, but first lining the crate with heavy paper to prevent the loose soil from sifting through. This packing is done five or six weeks before planting time, and the crates are kept in a moderately warm room. These rooted tubers must be handled somewhat carefully in planting, but one is well repaid for his trouble in getting a better quality of potatoes as well as a better yield. In packing the seed one man can prepare about 2,000 pounds a day, but this does not include the cutting.

The method is fully described in the annual report of the stations for 1911, page 17, and is very applicable to culture in the interior of Alaska.

The station crop this year comprises a little over $2\frac{1}{2}$ acres in 16 varieties, yielding approximately 100 bushels per acre. The tubers grade rather small, with a large percentage under market size. Seed for the main crop was sprouted, but a small plat was planted to each variety with unsprouted seed as a still further test of the relative value of sprouted seed over that not sprouted. The results are shown in the following table:

Comparative yields of sprouted and unsprouted potatoes at the Fairbanks Station in 1913.

Variety.	Number of hills.	Yield.		Rate per acre.	
		Seed sprouted.	Seed unsprouted.	Seed sprouted.	Seed unsprouted.
		Pounds.	Pounds.	Bushels.	Bushels.
Burpee Early.....	20	15	12	175	140
Vornehm.....	20	12	11	140	128
Garfield.....	20	12	9	140	105
Vigerna.....	20	13	12	151	140
White Mammoth.....	20	14	11	163	128
Early Michigan.....	20	17	16	198	186
Early Market.....	20	14	12	163	140
Gold Coin.....	20	21	15	245	175
Early Ohio.....	20	15	14	175	163
Eureka.....	20	19	11	221	128
Eidlevile.....	20	17	14	198	163
Ohio Junior.....	20	15	12	175	140
White Beauty.....	20	11	6	128	70
Extra Early Pioneer.....	20	15	7	175	81
Irish Cobbler.....	20	18	8	210	93
Extra Early Ohio.....	20	17	14	198	163

It might be noted that Gold Coin, Eureka, and Irish Cobbler were the heaviest yielders in this test from sprouted seed. In fact, in every instance there is an appreciable increase in like varieties where the seed was sprouted.

THE GARDEN.

Gardening in Alaska is a pronounced success, having been thoroughly tried out by many market gardeners who depend entirely on

their gardens for a living. (Pl. XV, fig 2, p. 64.) All of the more hardy vegetables do as well in Alaska as in any of the States.

Tomatoes have been set out in the open garden for three successive years. In 1911 the vines bore a very fair crop of green tomatoes, and some were beginning to ripen when frosted. The vines did not do so well in 1912, although some green fruit was gathered.

In 1913 some 20 plants of the Ponderosa variety were set outside early in June. These vines made a tremendous growth for outdoor culture in a northern latitude, having required pruning several times. They were pruned to two stems and tied to small stakes. Each vine bore from 4 to 6 clusters of fruit, many of these tomatoes weighing from 6 to 10 ounces each. A dozen vines bore about 100 pounds. Several tomatoes ripened on the vines before they were killed on August 28.

These plants were growing beside corn, beans, and buckwheat, which were badly frosted on August 14, while the tomatoes were not injured.

Although it is not expected that tomatoes can be ripened out of doors for commercial purposes, a reasonable quantity of the green fruit can usually be grown, and there is some demand for green tomatoes for preserves, pickles, etc.

Rhubarb with proper cultivation does very well, and there is also some demand for this vegetable.

Refugee wax beans were ready for table use by August 5.

Green peas can be had in abundance practically all summer by planting early and late varieties, and the early varieties will always ripen the early seedlings.

It has often been repeated that carrots, turnips, rutabagas, beets, parsnips, radishes, etc., grow abundantly, as do also cabbage, cauliflower, celery, lettuce, and spinach.

The root maggot infested the turnips badly. Complaints came in from neighboring gardeners that the root maggot damaged the cabbage and cauliflower more or less, but these crops were not materially injured at the station.

Two varieties of corn were planted in the garden on May 27. One of these was from seed grown at Haines, Alaska, in 1912. Tassels were showing July 15; two to four ears set on most of the stalks. Some of these showed the silk July 25. The grains were formed and about half made when the crop was killed by frost on August 14. The growth was about 5 feet.

Extra Early Adams, a sweet corn, started tasseling about August 8, but showed no signs of earing when killed by frost August 14. This variety was about 6 feet tall.

Several hundred hybrid strawberry plants were received from Sitka. These plants arrived in bad condition, having been a long

time in transit. Many plants were dead. Those showing any life were immediately set out in the garden, but only 40 lived. They made so little growth that it was thought best to lift them and set them in the cellar for the winter. A few of each variety, save one, are represented among the number.

THE MARKET.

The market conditions have not changed materially since the writer's report for 1912 was written, except that perhaps the native potato is slowly gaining a place in the open market. This is probably due, however, to a shortage in the imported stock. In 1912 the merchants shipped in a very large tonnage, notwithstanding the fact that some 300 tons of potatoes were raised in the district. This made a great overplus of potatoes on the market, and since the native product has proved to be a better keeper than the outside potato upward of a thousand crates of the imported tubers had to be dumped out for hog feed during the early summer when the firm native stock came into sharp demand, until the whole 1912 crop was used up by the time the first shipments arrived from the outside. As a result many consumers learned that Alaska-grown potatoes are really good to eat, and the shippers are less anxious to swamp the market with outside products when the same can be raised in the country. It is safe to say that with the proper encouragement to the farmers it would be unnecessary to ship a pound of outside potatoes into the country. Unfortunately, this was a very poor year for potatoes, and the quality was not as good as usual, which will be somewhat detrimental to the industry.

There is some demand for native grain hay, but a number of the farmers have sold at \$40 per ton this year. The writer doubts very much if grain hay can be raised and sold at that price with any profit under present conditions.

There seems to be a fair demand for all poultry and pork products, but prices for these also are on the decline. However, foodstuffs of nearly every kind are somewhat cheaper than usual.

MAINTENANCE OF THE SOIL.

It has been stated in a former report that the Alaska soil seems soon to become exhausted, and the problem is how to maintain fertility. It has already been demonstrated that by summer plowing the land and letting it rest every other year fairly good crops can be attained. In this respect Alaska is not materially different from some farming sections of the States, where summer plowing must be resorted to in order to obtain fair crops. The reader should bear in mind the fact that the ground here is frozen for nearly seven

months in the year, during which time little or no chemical change can take place to liberate plant food; therefore, to farm the land every other year would be practically the same as farming the land every year in the milder zones.

Another method which has already given excellent results is the rotation of cultivated crops with grain crops. The beneficial results are probably due mostly to the cultivation, as the frequent stirring quickens the action of the air on the soil constituents.

On one or two occasions a heavy crop of buckwheat was plowed under, which brought the soil into a perfect state of tilth. Buckwheat or spring rye, sown early, make excellent crops to turn under by the first of August, but the farmer will have to depend on imported seed, for neither crop will ripen sufficient seed as a rule in this climate.

There is no doubt that a fair crop of red or alsike clover can be obtained by the middle of August for plowing under with good results if the seed is drilled in early in the spring and about 100 pounds to the acre of sodium nitrate harrowed in before seeding. This crop would be much more valuable if it could be left over winter and then plowed under about July of the second year, but there is some danger of its winterkilling, and by being turned under the first year the advantage of summer fallow is obtained and also some green manuring without losing the use of the land for two years. Land is expensive to clear, and the early settler can not afford to give up his few available acres for so long a period without returns. Red clover will often survive the winter, where it comes up along the old trails in the woods, but field demonstration so far indicates that it will be an uncertain crop.

The lupines, vetches, and field peas have not been tried as yet at this station.

The soil under the usual cultivation soon becomes very compact about the plow sole, and the force of capillarity seems to be cut off in some measure, as was evidenced during the dry period of this season. Deeper plowing will have to be resorted to, and subsoiling would be very beneficial, no doubt. An inference as to the result of this manner of soil treatment is obtained by observing the ranker growth of vegetation below old dumps where the subsoil has been leached out by the spring thaws and summer rains. This conclusion, however, might be misleading, since the soil thrown out of prospect holes would be acted upon by the atmosphere with an effect similar to that of summer plowing. It was also observed that where dirt from digging a cellar was spread thinly over new ground below the cottage some years ago and cultivated into the new breaking, potatoes yielded better than elsewhere on the farm.

It is the writer's opinion that commercial fertilizers will have to be resorted to sooner or later, and the sooner the better. The question of transportation may seem prohibitive, but it is not so. The soil responds readily to fertilizers, and the prices of products are higher in proportion to the cost of fertilizers than in the States. It has been demonstrated at the station that \$10 worth (200 pounds) of sodium nitrate harrowed into a thin soil on a northern slope increased the hay crop by 1 ton per acre, and the hay was sold in the stack in the field for \$45 per ton. Similar ground treated in exactly the same manner, except that no fertilizer was used, produced only half a ton to the acre the same year, which did not pay the cost of the labor. By adding 200 pounds of nitrate, at a cost of \$10, there was a gain of \$35 per acre, from which deduction should be made for the hour required to apply the nitrate to the soil by hand and the extra work to shock and haul the additional ton of hay to the stack.

The potato crop has been increased 80 bushels per acre by the application of 150 pounds of nitrate, or at least such results followed in 1912, when the crop on a single acre was 80 bushels in excess of that raised on the same acre in 1911 without fertilizer.

The gardeners about Fairbanks fertilize heavily with stable manure, but this is out of the question on the country farms, for stock raising under present conditions is not profitable except in a very small way.

It is recommended that this station undertake experiments in the use of commercial fertilizers on a rather extensive scale in the very near future on both the grain and the potato crops.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Superintendent.*

CLIMATIC CONDITIONS.

Something over a year ago it was claimed that the Japanese current had shifted considerably farther north, and predictions were freely made that this would result in a general rise of temperature throughout Alaska. The winter of 1912-13 gave evidence that no such change was being ushered in as yet, for the mean maximum for 48 days, from December 16 to January 31, inclusive, was -14.8° F. In other words, the temperature was below zero for 1 month and 18 days, which is the longest period on record at this station. The mean minimum for the 48 days was -28.5° F., the minimum temperatures ranging from -50° to -2° F. The snowfall for the winter was light, totaling but 32.2 inches, a little over half of which fell by December 31. April was fairly warm, with only 0.01 inch

of precipitation, and by the end of the month little snow remained on the fields. May, June, and July were somewhat drier and warmer than normal, with a maximum temperature for the season of 94° F. on June 25. The warm, dry weather continued into August up to the 13th. That night there was a light killing frost, the first of the season, and the earliest since this station was established. The month closed with unprecedented weather, which continued throughout the remainder of the open season. August 29 the ground was covered with snow, and more snow fell the next day, all of which was melted by evening, but the premonitory chill of winter remained. Killing frosts were recorded on August 14, 26, 28, and 29, the minimum, 23° F., occurring August 29. There were but three clear days during the month. Precipitation by months for the summer of 1913 is as follows: May, 0.83 inch; June, 0.41; July, 1.41; August, 1.22; and September, 1.24 inches. Total, 5.11 inches. This is 2.34 inches less than for the corresponding period of the preceding year and very close to the nine-year average of 5.72 inches for the five months named.

WORK IN GENERAL.

A strip of land a little less than 5 acres in extent and extending from the brome-grass field to the river bank (1,000 feet) was cleared this season. This land drains well toward the river, but otherwise lies comparatively level. The soil on the most of it is rather heavy and black, and while not as well adapted for spring crops as the hillside land, it ought to be valuable for grasses and legumes, and also for winter grain.

The timber growth consisted of stunted spruce that had been killed by repeated burning, and most of the moss on all but 1½ acres, where it was kept wet by natural drainage, was also burned off. A record of the labor required to clear this land places the cost at \$134 per acre. Where there was practically no moss the cost was \$102 per acre, mounting up to \$200 per acre where the moss was heavy and green. Where the ground can be burned over and most of the moss destroyed it has been found advantageous to use a coulter to tear up what remains, following the coulter with a heavy harrow and then throwing the moss into piles with forks to facilitate burning. But where the moss is heavy and too wet to burn as it lies on the ground, stripping it off with mattocks, though tedious, has been found to be the most expeditious in the end.

In addition to the 5 acres, three-eighths of an acre was cleared and plowed on a high bench about a quarter of a mile back of the cottage. This will be cropped with potatoes and buckwheat next season to determine whether or not this bench land is immune from the early fall frosts that were so destructive this year.

A barn 40 feet long by 18 feet wide and 16 feet to the rafter plate was built adjoining the building erected in 1910. The addition contains stable room for three horses, a feed and harness room, and an 18-foot driveway. Next year it is planned to sink a 7,000 or 8,000 gallon storage tank in this driveway level with the floor, covering same with a tight 2-inch floor. The water from the barn roof will be piped into the tank and will then be used as needed to water the horses both summer and winter. The floor over the tank will be used as a thrashing floor.

A shed 16 feet wide and extending the full length of the addition to conform with the shed on the building adjoining was also built, and a similar shed will be built on the other side next year. The driveway will extend through both these sheds, making it 50 feet long by 18 feet wide. When the remaining shed is built, as mentioned above, the ground floor of the barn will be 50 by 70 feet. The second story of the 40-foot section is used for hay and is equipped with a grapple hay fork, while the second story of the 30-foot section, built in 1910, is used for a granary, and the lower story for a workshop and implement and tool room.

An ice house 12 feet square, with a 7-foot ceiling, was built into the face of the hill beside the root cellar. Poles were used entirely in its construction, so that the only expense entailed was the labor. The roof is heavily covered with moss and earth.

Seven acres were summer fallowed this year, a 3-acre field and a 4-acre field. The stable manure that had accumulated during the winter was hauled out over the snow in the spring and put in piles on the 3-acre field, covering about half the field. The remaining half was covered with straw. The field was then deeply plowed and given several diskings during the summer. A part of this field will be planted with potatoes next year.

The 4-acre field was seeded with barley and oats May 27. A good stand was secured, but largely because of the dry weather throughout June the growth of straw was rather short, and July 24 the plow was started in the field and the crop turned under.

Experience here as elsewhere has shown that the beneficial effect of summer fallowing is easily traceable for two or three years, both in increase of crop and in the improved physical condition of the soil. Unless occasionally fertilized, the average soil in this valley will not produce satisfactory crops in successive seasons. The upland soil is very much in need of humus, and to supply this deficiency a suitable soiling crop could be used advantageously, since manure in sufficient quantity is not to be had.

Canadian field peas have been tried with a view to using them for a soiling crop, but on poor ground (the ground that needs it) the growth is short and spindling.

A few plants of volunteer sweet clover made such a strong growth on unfertilized ground last year that a trial plat of one-eighth acre was seeded with sweet clover this year. The growth at the close of the season ranged from 1 to 2 feet. Next year, if it winters well, it will likely grow to a height of from 2 to 5 feet, and if plowed under before the stems become too woody will add an appreciable amount of humus to the soil. However, the recent successful experiments with alfalfa point to a better way to upbuild the soil of the Alaska farms.

As usual, all the ground to be cropped next year has been winter fallowed. If the ground is left to be plowed in the spring there is sure to be a wet corner or end that will delay the plowing or if plowed will leave that portion unfit for cropping. Then, too, ground lying rough as left by the plow will dry off more quickly than if left smooth, and so permits of getting the seed into the ground earlier, which is an important item in this country that should never be lost sight of, and all plans should be laid with that fact in mind.

About 6 acres were cropped for hay, yielding perhaps a trifle less than a ton per acre. This amount, with what is left from last year's crop, will be ample to feed the work horses. Four and one-half acres of the 6 acres was oat field; the rest is brome-grass meadow of a couple of years' standing, to wit, one acre field and a half-acre field up a draw that is too wet for spring cropping. To the meadow in the draw a supplementary strip was seeded with brome grass last spring in order to square up the field. Brome grass is perfectly hardy here and yields a fair quality and quantity of hay.

ALFALFA AND OTHER LEGUMES.

At this writing there are experimental plats of 14 varieties and strains of alfalfa and 7 of clover at this station. As indicated in the report for 1911, these varieties were received from various sources, and additional study may show that some are improperly classified. For convenience, the alfalfa as now growing at Rampart may be roughly divided into four groups, without regard to their botanical relations, as follows:

Group 1. Erect in growth; purple flowers; seed pods spiral shaped and black when ripe.

Group 2. Erect in growth; stalks coarse; flowers yellow; no seed pods set.

Group 3. Somewhat spreading in growth; stalks slender and rather short; flowers yellow; seed pods falcion shaped and a light yellow when ripe.

Group 4. Recumbent in growth; stalks coarse; flowers yellow; no seed pods set.

Group 1 includes Grimm, Sand Lucern, Cherno, and Mongolian, all of which ripened some seed; also Turkestan, which did not ripen seed. This type is a strong grower, having coarse stalks and

an abundance of leaves. They flowered freely, particularly Grimm (Pl. VI, fig. 1), beginning June 12, and podded very heavily, with the exception of Turkestan. Some of the pods contained as high as 14 seeds. The pods are spiral, with generally two complete turns, and are black when ripe; diameter of spiral, 6 millimeters. The seed is light yellow and comparatively large; length, 3 millimeters; width, 1.5 millimeters.

Group 2 includes North Sweden, Semipalatinsk, Omsk, and Cos-sack. Though vigorous growers, none produced any ripe seed—not even pods. The flowers as a type are bright yellow, North Sweden being an exception, bearing pale-yellow flowers. Stalks are coarse, leaves abundant. Group 3 includes *Medicago falcata* and *M. ruthenica*. The latter is reputed to be the hardiest alfalfa known. However, as grown here it has not shown greater hardiness than the related *M. falcata*, or, for that matter, any of the purple-flowered varieties above mentioned. *M. ruthenica* is not a strong grower. The first two years of its growth here the plants were so small that the plat looked bare. This year the growth was much better, some of the plants reaching a height of 12 inches. The stalks are slender, and the leaves small, though fairly abundant. The flowers are dainty creations, the petals being a rich yellow on top and purple underneath. The plant is pretty enough to be grown as a border plant in flower beds. No seed pods formed.

The growth of *M. falcata* is much more vigorous than *M. ruthenica*, the average height being 18 inches. The stalks are rather slender, with many branches; leaves are small and not abundant. It began blooming June 20. (Pl. VI, fig. 2.) Pods formed very freely and began ripening August 12. The sword-shaped pods contain from six to eight seeds. On ripening the pods show a strong disposition to burst and scatter the seed. Length of pods is 10 millimeters. The seeds are much smaller than those of type 1 and of a light-brown color. Length of seed is 2 millimeters; width, 1 millimeter.

Group 4 is represented by Gobi Desert and Obb. In growth characteristics these two are identical, spreading flat on the ground, which habit may be taken as indicative of their origin. The stalks are fairly coarse, and the leaves large and abundant. The flowers are bright yellow, but no seed pods formed. One Gobi Desert plant had a spread of 6.5 feet.

Before gathering the seed the plats were thoroughly rogued of those plants that bore no ripe seed. The remaining plants were staked and numbered, and the seed from each plant kept separate and given the same number as the plant that bore it. Next spring each individual lot will be planted separately and thinly in rows. This method permits of a study of individuals, facilitates weeding

out the undesirables, and so allows room for the maximum development of each plant.

Hardiness can not be bred into a plant by selection. But by elimination the less hardy plants may be weeded out, thus bringing the level of excellence of the whole up to that of the original few.

The work with alfalfa will be extended as fast as conditions permit. Seed of the most desirable varieties is scarce, and the area seeded to these will depend largely on the amount of seed that can be ripened here.

The production of alfalfa seed will be emphasized. Since the moisture content of the soil seems to bear a vital relation to the production of seed, it is the intention to grow the alfalfa in rows wide enough apart to permit of cultivation with a horse. By a proper system of tillage the surface of the ground may be kept dried out during the months of July and August, when the seed is ripening. Early cultivation will also loosen up and aerate the soil after being packed by the melting snow and crusted by sun and wind.

August 30, 1912, one plat of Grimm alfalfa was inoculated with alfalfa soil received from the Agricultural Experiment Station, Brookings, S. Dak. This summer an examination showed several plants with well-developed nodules on the roots, the first to be found here. On July 10 of this year several plats were treated with a proprietary culture of nitrogen-fixing bacteria. Application was made to alternate rows in order to be able to check up the beneficial effect, if any.

During June, 1911, a small plat was seeded with *Trifolium lupinaster*, S. P. I. No. 24458. About a 25 per cent stand was secured, and the growth the first year was very light. All survived the winter and during the summer of 1912 made a fair growth and ripened a small amount of seed. This year the plat made a still better showing. Blooms appeared June 11, and the first ripe seed was gathered July 17, nearly one month earlier than the first ripe alfalfa seed. The seed shatters quite freely and should be gathered as soon as ripe.

The leaf growth of the lupinaster is scanty. The stalk is erect and short, resembling very closely the native fireweed. The average height is 16 inches. The shape of the flowering portion resembles red clover. As indicated by the color of the blossom, the variety grown here is not a pure strain, some of the plants bearing red heads and some white. The seed of each color was kept separate in order to produce a pure type.

How valuable this legume will be for this latitude remains to be proved by further and continued experiments. As grown so far it would be a failure from the standpoint of hay production. Its valu-

able features are perfect winter hardiness and the ability to ripen seed under adverse conditions, as evidenced during the season of 1912, when none of the alfalfas ripened seed.

Red clover, alsike clover, and white clover have all been tried, and none have been found hardy. Alsike lived through a couple of winters and ripened some seed. Of the three named above it is by far the hardiest. White clover will ripen some seed almost every year and so, in a measure, will perpetuate itself in favorable locations.

Last spring 25 pounds of vetch was drilled in on a field freshly seeded with oats for hay, but a poor stand resulted, and what did come up made a very poor growth. This is the second trial with vetch, spring-sown, and the result has been a practical failure each time. Winter vetch, sown in the fall, was a complete failure.

About one-eighth acre was seeded to sweet clover May 21 of this year. The stand is all that could be desired, and the growth vigorous. If the plant does as well as several volunteer plants did a year ago, it will make a strong stalk growth of from 3 to 5 feet in height. Sweet clover is a biennial and so must be renewed every other year. As mentioned elsewhere in this report, sweet clover may prove valuable as a soiling crop. Some of the sweet clover was cut and offered green to the horses, and at the same time some green alfalfa. Both were eaten greedily, and no preference shown.

BARLEY.

The work with barley the past season followed closely the lines laid down in previous years. Seeding began May 12, when 64 varieties and strains of pedigreed and hybrid barley (Pl. VI, fig. 3) were seeded in uniform plats 2 rods long and 2 drill rows wide.

Without exception a good stand resulted, and the early growth was rapid. By June 24 the earliest were heading, and the continued warm, dry days hastened the blooming and filling periods so much that by July 21 the first ripe plats were cut. From May 12 to July 21, inclusive, is 71 days, which is record time for ripening barley, at least for this station. This barley was perfectly normal, the heads well filled, and the grains plump.

This year Pamir barley, heretofore the earliest to ripen, had a competitor in hybrid 20B. The latter headed one day earlier than Pamir, but both ripened at the same time. Pamir grew to its usual height of 24 inches, with heads 1.75 inches long, containing on an average 36 grains. It is a heavily bearded, 6-rowed type.

Barley 20B grew to a height of 34 inches, bearing heads 3 inches long containing on an average 42 grains. It is also 6-rowed, but hooded and hull-less, the result of a cross between hybrid No. 1a-1 and G. I. No. 279, the former hooded, the latter bearded, both 6-rowed. All the barley, pedigreed and hybrids, ripened, and none

later than August 14, the date of the earliest frost this year. Nearly all of the 42 hybrids grown possess desirable qualities, and several promise to meet all requirements, being early, stiff strawed, and beardless. Among the number may be found most of the usual types of barley, both 2-rowed and 6-rowed, bearded and beardless, hooded and hull-less, having either black or amber-colored grains (Pl. VII, fig. 1). Several bore heads 4 inches long containing 60 grains. Unfortunately, these heavy headed 6-rowed types possess rather weak straw, and for that reason are undesirable. The type that promises best is 2-rowed, hooded, with either black or amber-colored grains. The straw is stiff enough to withstand rainstorms, and they are among the earliest. Average number of grains per head 22. Compared with 6-rowed types, the number of grains per head is small, but tests at various experiment stations show that the 2-rowed type will often outyield the 6-rowed type in spite of the handicap of fewer grains per head.

From now on the work with barley, aside from pedigreeing some 20 standard sorts that have been grown here for several years, will consist mainly in trying out the different types of hybrids and selecting those best adapted to local conditions. Several years will be required to prove thoroughly by field tests the most prolific and general all-around type.

A number of barley heads were cross-fertilized this year, and this phase of the work will be continued next year in so far as time permits. It is intended from now on to devote more time to crossbreeding oats and wheat, and possibly alfalfa.

About three-eighths of an acre was seeded with hull-less barley, S. P. I. No. 12709, May 13. It headed June 28, standing thick and even, and gave every promise of a full crop. August 13 the field was ripe and was cut with a self-binder. For the last two years this barley has not done as well as formerly. The straw is shorter and, what is more important, many of the heads have sterile tips, and some are entirely sterile. No satisfactory explanation has been found. Other types of barley growing under identical conditions have perfect heads. The most evident conclusion is that this hull-less type is not adapted to continuous culture here. Two years ago this barley yielded at the rate of 60 bushels per acre.

It is for the above reason mainly that some 20-odd varieties of barley are being grown and pedigreed every year in order to determine which varieties, if any, show a tendency to run out.

OATS AND SPRING WHEAT.

Of the nine varieties of oats grown, none failed to ripen (Pl. VII, fig. 2). No new kinds were tried this year. One small field of three-eighths acre was seeded with Finnish Black oats May 13. Part of the

plat was on a high knoll, and there the growth was short; but on the lower end of the plat the oats were 48 inches high, with large, well-filled heads. The plat was cut with the self-binder August 13, just three months from the date of seeding (Pl. VIII, fig. 2).

A one-eighth acre plat was seeded with South Dakota oats No. 637, and a similar plat with Copperfield oats. Both plats produced good crops. Average length of straw, 40 inches. Both varieties were ripe and harvested August 24.

Oat No. 637 is a black type having large heads, plump grain, and a good length of straw. It has proved to be as early as Finnish Black and has the advantage of not shattering so badly when ripe. The heads are more compact but not quite so large, averaging from 5 to 10 grains less per head than the Finnish oat.

The South Dakota oat will be used next year in the hybridization work in connection with oat No. 278. This latter is an unusually fine, large, white oat, with a strong, bright straw, bearing heads containing on an average 90 grains each. Unfortunately it is a trifle late in ripening, but, if crossed with an early maturing type, the essential qualities of each may be combined and fixed in the resulting hybrid.

The earliest pedigreed oat grown this year was Yakutsk No. 498. Sowed May 12, it was ripe August 6, taking 86 days to reach maturity. Yakutsk is a white oat having short straw and small heads. Pedigreed plats of South Dakota and Finnish Black required 88 days to ripen, while Banner and No. 278 required 94 days.

The oat maturing in the least number of days was hybrid No. 25a, which ripened 81 days after seeding. This hybrid is the result of a cross made last year between Copperfield and Toholampi. Copperfield is a gray mutation of Finnish Black, and Toholampi is an early strain of the same variety imported from Dickursby, Finland, a couple of years ago. The resulting hybrids split up about equally into black and gray types. The heads are as large as the parent heads, and in this, their first year, ripened seven days earlier.

Experimental plats of Red Fife and Saskatchewan spring wheat were grown this year. The seed, station grown, was sown May 12 and produced a 99 per cent stand. Both varieties grew to a height of 40 inches, but neither ripened fully. The ripest heads were saved, and the grain, though somewhat shriveled, will be planted next spring. Red Fife seems a trifle earlier than Saskatchewan. However, the likelihood of developing an early strain by selection is rather remote, and it is realized that crossbreeding of the earliest types obtainable will have to be resorted to.

Last year several heads of Red Fife and Saskatchewan wheat were cross-pollenized. The resulting kernels were planted this spring. These hybrid plants headed a couple of days earlier than either of

the parents and were somewhat riper at the time of the first killing frost, but they still fall considerably short of what a spring wheat must be in order to ripen thoroughly.

Quite a number of crosses were made this year, using the same wheat as last year. Other spring types should be tried out and the likeliest ones used in crossbreeding. Perhaps a combination of types will be found whose offspring will have the much needed, paramount requisite—earliness.

VEGETABLES.

Three-fourths of an acre was planted with potatoes. This ground had been given a light dressing of stable manure the year before and then seeded with Canadian field peas and oats for hay. The hay crop was cut early to allow the second growth to come up and serve somewhat as a soiling crop when plowed under that fall.

In the spring the ground was cross disked, harrowed, and planked. This produced an all but perfect seed bed for potatoes, deep and friable. May 22 the rows were laid off with a plow, and the seed dropped by hand. As usual, the seed had been well sprouted. As soon as planted the furrows were filled in level with a specially constructed 4-foot plank drag having a V made of 2 by 4 studding nailed on the under side. This tool left the ground absolutely smooth and in the best condition to resist the dry weather that followed.

Extra Early Eureka, Extra Early Pioneer, Gold Coin, and Irish Cobbler were the main varieties planted. In the same field 36 varieties were planted, arranged for a 10-hill yield test. These had been grown in a small way for the two preceding years, and it seemed desirable to get more data on the salient qualities of each variety.

A 100 per cent stand was secured throughout the field. The early growth was retarded somewhat by lack of sufficient moisture, but by June 30 most of the varieties were in bloom. With July came some timely rain, and the prospect for a normal crop was good. Then, on August 14, just as the new potatoes were growing most rapidly, the unexpected frost came. Although the vines were not killed down to the ground, the growth was seriously checked. Had the usual good weather prevailed the remainder of August there would still have been a fair crop; but without exception the last 17 days of the month were cloudy and cool, culminating with snow on August 29 and 30, accompanied by freezing temperature.

The 10-hill yield test plats were dug September 11 by hand, and a week later the main crop was dug, using a new shaker potato digger which worked fairly well.

The yield was about 50 per cent of what it would have been in a normal season. The tubers averaged smaller and of poorer quality.

Of the four field varieties Irish Cobbler easily leads. As mentioned in last year's report, the tubers are borne on short root stocks. Thus there is a minimum loss of time in setting new potatoes. Then, too, during the usual dry months of June and July the short root stocks keep the new, tender tuber down in the moist earth, while tubers borne on long ones are often pushed out into the outer layer of dry earth. This latter condition is not conducive to rapid early growth, neither does it make for the best quality, for experiments show that potatoes of the best quality are produced when grown at a depth of about 4 inches, where the soil temperature is fairly uniform.

Two rows each across the field of pedigreed potatoes were planted. The varieties were: Eureka, Pioneer, Gold Coin, Irish Cobbler, and Burpee Superior. These did somewhat better than the stock seed. Burpee Superior made an especially fine showing. The potatoes were long and flat, eyes shallow, skin and flesh white, quality good, but not equal to Irish Cobbler. The above rows were hand dug, and the hills placed separately. The poor hills were then discarded, and next year the select hills will again be planted separately.

The 10-hill yield test will be tried out again next year in the hope that normal weather will prevail toward the close of the season and so produce results that are fairly indicative of average crops.

Of last year's 6-ton crop from two-thirds of an acre, 1.5 tons were sold locally at from 4 to 6 cents per pound. Three tons were fed to the three work horses, and the remainder used for seed and to supply the table.

During the winter and in the spring before the grass supplies succulent feed the addition of a few pounds of potatoes to their daily ration is much appreciated by the horses.

May 14, for the purpose of growing seed, 14 crates of turnips were planted on a hillside. The varieties were Yellow Finland, White Greentop Finland, Red Finland, Purpletop Finland, Petrowski, and Golden Ball. About 90 per cent of the roots grew and produced 28 pounds of first-class seed. A larger percentage of the seed ripened on the upper side of the plat, and next year the roots will be put on still higher ground to give the seed every advantage possible.

From the condition of the roots at planting time the White, Greentop, Purpletop, and Redtop Finland turnips are most excellent winter varieties. The flesh of all is white, very firm, well flavored, juicy, and crisp, much superior to any turnip tried heretofore. The roots are medium sized, flat, and have a small taproot.

Following the custom of previous years, the first pods on the garden peas were allowed to remain and ripen. Planted May 26, they began blooming June 18, and bore edible pods by July 1. By August 1 the first pods were ripe. About a gallon of ripe pods from each of two varieties, Alaska and Notts Excelsior, was gathered.

All the station-grown seed will be planted next year with a view to producing seed. Also an attempt will be made to ripen seed of carrots, parsnips, and radishes, and in general the production of seed, both garden and field, will receive special attention.

The following new root crops were tried. Only a small quantity of seed was available, enough of each variety to seed a row across the garden. Mangolds—Golden Tankard, S. P. I. No. 33681; Barres Half-long, S. P. I. Nos. 33676 and 33677; Barres Oval, S. P. I. No. 33678; Yellow Eckendorfer, S. P. I. No. 33674; Red Eckendorfer, S. P. I. No. 33675; and Rubra, S. P. I. No. 33680; also Forage sugar beet S. P. I. No. 33609.

Despite the fact that they were grown in rich garden soil, none of them made more than medium-sized roots. Moreover, many of the roots had an affection of the skin and the immediate flesh underneath, causing a shrinking in and blackening of the tissues. Cracks appeared in the affected areas, often penetrating to a depth of 0.5 of an inch.

Very likely the ground is unsuited to mangolds and kindred roots, for table beets grown in the same ground have been similarly affected for several years. A new locality will be tried next year.

REPORT OF WORK AT KODIAK LIVE-STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Superintendent.*

The work at Kodiak Station was of a different nature from that of former years. Entirely new conditions confronted us, due to the deposit of volcanic ash from Mount Katmai, which covered the country around about the station. The ash having settled on all level land to about $8\frac{1}{2}$ inches in depth, and becoming firmer, made the work of cultivation more like that of ordinary sandy soil. The erosion of the previous nine months was perhaps an inch on exposed level land, while on rolling and hilly land it was very great. In some places the ash was nearly all removed from the steeper hillsides by the agencies of frost and water from melted snow and rain. Freezing and thawing loosened the ash, and it was carried to the lower levels in great quantities, where it is rapidly building up, and much of it was carried out to sea by the water of the creeks and rivers. During the summer and fall months there was very little movement of the ash, but in the winter and early spring the erosion was rapid. Practically all the great slides of ash in the deep canyons were cleared out from the canyons and carried out onto the flats below. Deep cuts were made through the slides at the foot of the mountains, making it impossible to get over such places with



FIG. 1.—HYBRID BARLEYS, RAMPART STATION.

1, Staminate parent, G. I. No. 362; 2, pistillate parent, S. P. I. No. 19851; 3-7, hybrids Nos. 19B-1, 14A-2-1, 14A-2-2, 14C-1-1, and 21A.



FIG. 2.—OAT PLATS, RAMPART STATION.

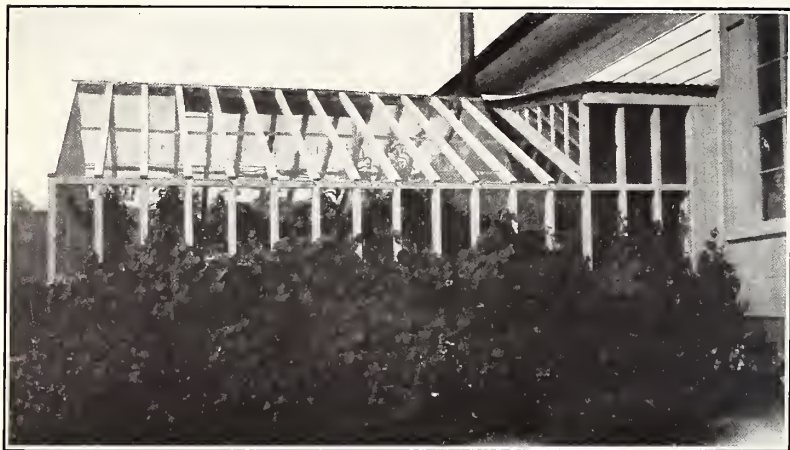


FIG. 1.—PROPAGATING HOUSE, RAMPART STATION.



FIG. 2.—HARVESTING OATS, RAMPART STATION.



FIG. 1.—MEADOW SEEDED MAY 30, 1913.

Photographed July 3, 1913.



FIG. 2.—MEADOW ABOVE.

Photographed August 10, 1913. Uneven growth due to hummocks.

RESTORING VEGETATION ON LAND COVERED WITH VOLCANIC ASH
ON KODIAK ISLAND.



FIG. 1.—EFFECT OF FERTILIZERS.

Fifty pounds superphosphate and 240 pounds nitrate of lime per acre on left.



FIG. 2.—CUTTING OATS FOR SILAGE, HILLSIDE MEADOW, SEPTEMBER 10, 1913.

RESTORING VEGETATION ON LAND COVERED WITH VOLCANIC ASH
ON KODIAK ISLAND.

team and wagon. Considerable ash was carried by the streams fed by melting snow on the mountains throughout the summer, all of which was carried out to sea. Streams were muddy the greater part of the summer and fall on this account, and this condition wrought havoc with the salmon coming to these streams to spawn. During freezing weather when there was no snow upon the ground there was much shifting of the ash by the heavy winds that prevail at such times, oftentimes causing great clouds of dust in the air that made it impossible to work outdoors and very bad on eyes of man and beast, even under shelter.

The work of the winter consisted mainly in caring for the live stock. The sheep and horses were kept at the station at Kodiak, where feed was shipped to them from the States, as there was no feed available in the country. Assistant Heideman was left in charge of the station. The cattle were wintered at Toppenish, Wash., where they were taken early in the fall of 1912.

The cattle were wintered principally upon wild hay and alfalfa hay for the calves and cows with young calves at side. The calves were allowed to run under an open shed at night and were fed a little grain, while the mature animals were fed in a rack which afforded a windbreak only, and during the day all were fed at large in the pasture. All came through the winter in good, thrifty condition. Early in April the herd was moved to Chehalis, Wash., at which place pasturage was to be had at a much lower cost than around Toppenish or within reasonable driving distance for the herd.

At Chehalis, Assistant Kelly was left in charge of the cattle for the summer. The calves were kept in a separate pasture from the cows and allowed to be with the cows at evening and morning only. This enabled the attendant to keep close watch on each calf and keep them tame and gentle, and the older cattle were handled daily by an attendant on foot, so as to keep them accustomed to such treatment. Twenty-three acres of oats were seeded for grain hay, from which we obtained 28 tons of very good hay, and some 50 acres of tame grass was cut, which yielded between 35 and 40 tons of hay of fair quality. All the hay was cured and stored in the barn without getting rained upon. The dry weather during August made it necessary to feed all the calves and some of the cows from that date. There is only about half enough hay to winter the herd.

The writer returned to Kodiak for the season's crop work, arriving there May 5 with supplies for the station, consisting of farm machinery, seed, commercial fertilizers, and feed for teams for the summer's work. The new machinery purchased for the station consisted of a manure spreader, tandem disk, disk drill with combination grain and fertilizer and grass-seeder attachment, hillside plow, and a smoothing harrow. Thirty tons of nitrate of lime and 2 tons

of superphosphate were purchased for crop work for the year. Five tons of seed oats and 1 ton of grass seed, together with 4 tons of oats for feed and 8 tons of hay, made a shipment of some 56 tons taken up by steamer.

Assistant Heideman, who had remained in charge of the station, was granted sick leave and left Kodiak on May 6. Owing to Mr. Heideman's illness no work in the fields was begun during April. The work of hauling the supplies from the dock was begun immediately, and the machinery set up at once. Competent help for such work was scarce. Mr. Heideman having to leave the work at this time of the year left us short of help at the station and delayed the work very much.

Field work began May 10 and was rushed as fast as the weather and field conditions would allow. The work of preparation of the soil for spring seeding was begun during the previous fall, beginning September 5, and continued until October 20. Twenty acres of meadow land covered with volcanic ash from 10 to 20 inches deep had been given a dressing of 18 tons of well-rotted manure per acre, disked under to prevent blowing away during the winter. The washing and blowing of the ash on this plat was greatly retarded by the manure.

At the dairy station adjoining the village of Kodiak 11 acres of rolling land had been double-disked and harrowed, which put it in ideal condition for seeding. Before diskings, 3 acres of this tract were given a dressing of 13 tons per acre of horse and sheep manure. The ash on this plat was about 6 inches deep on the average, and only the tops of the hummocks were reached by the disk. Owing to the rainy weather during the latter part of May, general field seeding was not begun until May 30 (Pl. IX, figs. 1 and 2). Then 10 acres of this plat were seeded to oats and 1 acre to barley, and at the same time given a dressing of 40 quarts of nitrate of lime per acre. It was then seeded to a mixture of grasses and clovers and harrowed (Pl. X, figs. 1 and 2).

A date test for seeding oats for hay was begun May 9 and continued at 10-day intervals until July 9. Weekly notes were taken when it was possible to do so.

At Kalsin Bay 50 acres, including that disked and manured in the previous fall, were double-disked and harrowed and put in good condition for seeding. Ten acres were seeded to oats, vetches, and a mixture of grasses, and 40 acres to oats and a mixture of grasses and clovers. All were given a dressing of from 40 to 60 quarts of nitrate of lime per acre at the time of seeding, and later when the oats were from 2 to 4 inches high a second dressing was spread. (Pl. XI, figs. 1 and 2). General field seeding was finished June 27. Following this 7 acres of land were given a dressing of 13 tons of

well-rotted manure per acre after double-disking, then harrowed and seeded to a mixture of grasses and clovers and harrowed again. This put the ground in good condition. An acre of rape was sown for fall pasture for the sheep. Tests of a mixture of fertilizers, superphosphate and nitrate of lime, were also made with and without manure. A quarter of an acre of turnips and rutabagas was seeded and was given surface dressing of well-rotted manure.

A good stand of oats was secured on nearly all of the land seeded and a good stand of grass on more than half that seeded. The dry weather during June and the first half of July damaged the oats and retarded their growth very much. The latter half of July was wet and followed by warm weather in August, and the oats were greatly revived and grew rapidly. Oats seeded May 9 came up unevenly and were only an inch high June 9, and the May 19 seeding was just coming up. From that date the oats came up in 10 days or less after seeding and made fair growth until July 5, when the dry weather began to tell upon their growth. Then for 10 days the oats suffered much from the lack of moisture. Most of the early seeding seemed sure of killing out, but the rain came July 15 and greatly revived the crop. From that date the growth was steady, and the oats headed nicely.

Oats seeded in the ash too deep for the roots to reach the soil beneath, with nitrate of lime, stood from 15 to 24 inches high. On the same soil, with a mixture of nitrate of lime and superphosphate, the oats stood from 20 to 30 inches high, while on manured plats adjoining the oats stood 30 to 40 inches high. On the tops of the hummocks, where the roots reached the soil beneath, the oats stood 4 feet high (Pl. XII, fig. 1). On rolling land, where the roots generally went through the ash and where manure was used, the oats stood 5 feet high and were very heavy, lodging in many places. The grasses grew slowly, but steadily, and where not shaded too much the color was good and the plants thrifty. Rape did poorly except where the roots went through the ash to the soil beneath. The clovers did very poorly except where there was manure. The growth was very slow all the season where there was no manure. On manured plats, however, clover did well, and white clover put out some bloom. Grass plats were seeded to determine the better grasses for growing on the ash. Portions of each plat were treated with both well-rotted and fresh stable manure, also with nitrate of lime.

The rye seeded during the fall of 1912 winterkilled badly where the erosion had bared the roots, but in protected spots, where the snow lay on the ground most of the winter in drifts, the stand was good, and the rye ripened fairly well filled. Scattering stalks of rye, estimated at 5 per cent of a stand over the whole plat, headed

out from 40 to 50 inches high. The wheat seeded in the fall all winterkilled. Scattering timothy seeded from manure spread during the fall headed at about 24 inches and gave promise of making fair hay under favorable conditions.

Good growing weather continued during the period from July 15 until late in September. A few days of good haying weather came during the latter part of August and fore part of September. By cutting with a scythe on the steep hillside and with the mower on small patches in the valley about $4\frac{1}{2}$ tons of native blue-top hay of excellent quality was secured. None of the oats were mature enough to cut for hay at that date. Again on September 8 the weather cleared for a few days, and $3\frac{1}{2}$ tons of beach-grass hay was made on an island 5 miles from the station. Considerable difficulty was experienced in curing this hay on account of damp weather. The beach grass takes five days usually to cure sufficiently for storing in large quantities, and with the damp weather this year it took three weeks to cure.

Cutting oats for silage was commenced September 10 and continued until October 4, on the land manured in the spring. On rolling land the oats were very heavy and lodged in many places, and it was impossible to rake them up with a horserake. Hand rakes were resorted to and used for all the oats put in the silo. Where the oats made a light yield the horserake would not gather up the green oats. Another disadvantage in using the horserake was found—the teeth dug up the ash so much that great quantities of the ash would adhere to the wet green oats.

On some of the land the clods of ash were troublesome in raking up with the oats by the hand rakes. This difficulty was not experienced with the oat hay, as the dry hay would not gather the clods so badly.

The new silo was erected at the dairy station in order to take care of the crop. The silo was given two coats of paint.

The heavy growth of oats from the 3 acres manured and 2 acres given a mixture of fertilizers made it impossible to cure the oats for hay, so they were put up for silage. The manured plat yielded from 7 to 8 tons of silage per acre, and from the mixed fertilizer plat a yield of 3 to 4 tons per acre was obtained. Five acres were cut for hay which yielded nearly a ton per acre. From the 10 acres of oats seeded on rolling land about 30 tons of silage and $4\frac{1}{2}$ tons of hay were obtained.

At Kalsin Bay, on the flats and beach lands the growth was slower and the yield was much lighter than on the hillside land. Here the ash ranged in depth from 8 to 20 inches. The yield ranged from 1 ton to 2 tons per acre. Between 45 and 50 tons of oat silage were put up, and 3 tons of oat hay from the flats.

Good hay weather came again in October, and some 7 or 8 tons of native blue-top hay were cut and cured. The grass was mature and fully seeded, but was green and made very good hay. This last hay cut was from land that formerly was too rough and swampy to cut over with a machine, but had leveled up with the ash, making a good, firm, and level bed over which to cut, and gave an exceptionally heavy yield of hay. (Pl. XII, fig. 2.) In many places the grass stood higher than the horses' backs. To get to these small patches of grass it was necessary to cut a road through half a mile of timber and build a 30-foot bridge over a stream too deep to ford. The bridge was built of green logs placed by means of block and tackle and the teams. The planking was of split logs and poles. This road opens the way to numerous small parks in the timber which will afford considerable hay another year.

The lateness of frost this year and the fair weather of October made it possible to get up enough hay for the winter for the horses and sheep. The work of hauling the hay from Kalsin Bay to Kodiak by means of skiff and launch was accomplished without mishap. From 3 to 4 tons of hay was hauled at a trip.

Transferring all or a part of the equipment and teams was necessary several times during the season. Being short of the necessary and competent help made it more expensive to carry on the work than it should have been.

The uncertainty of the weather also necessitated duplicate work oft-times. With proper harvesting machinery, such as an ensilage cutter with gas engine, a side-delivery rake which acts as a tedder as well as a rake, and a hay loader, the work would have been lightened and expedited threefold or more.

Putting up oats for silage without using a cutter was in the nature of an experiment for us. Observations made of the silage, after the fermentation was well over, showed a large quantity spoiled on the top. This was largely due to the impossibility of sufficiently excluding the air for proper fermentation.

During the season between seeding time and harvest, after spreading the second dressing of nitrate of lime, the work of leveling the yards and grading roads about the barns and leading to the fields, hauling manure, digging out fences and rebuilding them, and putting buildings in proper repair was continued. Following the spreading of manure the land was double-disked and put in good condition for fall seeding.

Fall rye was seeded again this fall to test its ability to stand the winter. One-half acre was seeded on the hillside at the dairy station on September 17. This came up nicely and bids fair to winter well. Four and a half acres were seeded September 26 at Kalsin Bay on a well-protected field.

The work of plowing hillside land was begun early in the fall and continued at odd times until late in October. The hillside plow did good work and left the ground in good shape for weathering during the winter. Three to 4 inches of clay loam was turned up, and from 4 to 6 inches of ash turned under. The work was very heavy on both man and team. The lay of the ground made it impossible to use more than two horses to the plow, and the numerous small stones embedded in the soil added to the difficulty of plowing. The resulting soil is of the nature of light sandy loam and works much easier than the former soil and warms up more readily in the spring. The surface drainage is better than that of the old soil, and, as shown by this year's crop in the garden, it produces heavier yields and better quality in vegetables and potatoes. The growth was more rapid than ever known previous to the ash fall.

The fall growth on the hillside after the oat hay and silage was cut was sufficient, on 10 acres, to pasture six horses for more than a month. The roots of the oats firmly bound the ash, so there will be very little erosion on fields seeded this year.

CLIMATIC CONDITIONS AFFECTING CROP WORK.

Weather observations for the year at Kodiak were not complete on account of the fact that the thermometers and rain gauge were lost in the ash slide during the eruption in 1912 and were not replaced until March 6, and the maximum thermometer was broken in the mails and was not replaced until July 1.

The fall of 1912 was warmer than usual, and the first killing frost came on October 17. Then followed a few days of freezing weather and high westerly winds, which carried great clouds of volcanic ash from the mountains. Closely following the westerly blows, heavy northeasters prevailed for the greater part of November and up to December 19, during which time the erosion upon the ash-covered mountains was very great. From this date light snows fell and covered the ground, and the temperature fell several degrees below zero until the fore part of January, when normal weather conditions returned, giving the usual number of clear days for January and about normal snowfall and rain. The temperature rose in February, and the snow went off soon after falling. Cloudy weather prevailed the greater part of the month. The month of March was unusually warm and cloudier than normal. But little snow fell during the month, and none lay on the ground for more than a few hours at a time. Frost left the ground early in the month. The first week in April was colder than usual for that time of the year, and the snowfall was 6 inches above normal, while the total precipitation was 2 inches below normal. There were 11 clear days for the month, which

is far above normal, and another unusual condition was the westerly winds that prevailed for nearly half the month. May weather was unsettled. The first four days were clear, and the remainder of the month cloudy or partly cloudy, and the precipitation was 2 inches above normal. This condition retarded the growth of grass and field and garden crops, and the excessively rainy weather during the last half of the month retarded field work considerably. June was about normal except in precipitation, which was more than an inch below normal, and the dry weather coming the latter half of the month and followed by two weeks' drought in July caused damage to all crops seeded in the spring. July was cloudy, but about normal in temperature and precipitation. The last part of the month was wet and afforded excellent growing weather. The weather for August was normal as compared with the past six years, there being 5 clear days, 16 partly cloudy, and 10 cloudy days, and 4.79 inches of rainfall distributed throughout the month. This made it impossible to cure hay until the last few days of August and the first four days of September. After September 4 rainy weather prevailed for the remainder of the month. The temperature was normal, and there was no frost.

The growing season was longer than usual. The frost leaving the ground early in the spring gave the grass that came through the ash an early start. By May 8 there was good pasture for sheep, and fair pasture for cattle by the middle of the month. The drought in June and July did not affect the native grass in the least, as there was sufficient moisture below the ash to nourish the grass, and only that seeded in the spring was damaged. Very little grass came through the ash on the flats except in old swamps (Pl. XII, fig. 2) and in places where the ash had been washed from the ground the summer following the eruption. The grass on the hillsides grew rapidly all the summer months and produced a heavy crop of seed that fully matured before frost came.

All vegetation made greater growth during the past season than was ever before observed. This may be accounted for by the fact that the available plant food, not having been drawn upon during the past season, was more abundant than usual, and that a large quantity of decaying vegetation was covered by the ash. That there was some plant food available in the ash was shown by the fact that oats seeded in the ash alone lived through the season and grew to several inches in height and headed out. That there was more available plant food this season than last was shown by the heavier growth of oats seeded in the ash at the same time of the year. Therefore one is led to believe that the action of weathering and other conditions brought about by the decaying vegetation under the ash have rendered some of the elements of the ash available for plant food.

DATE TEST FOR SEEDING OATS FOR HAY.

Beginning May 9, oats were seeded at 10-day intervals until July 9, and given a dressing of nitrate of lime at the rate of 240 pounds per acre. From these tests, carried on for the one season, the oats seeded from May 19 to June 9 produced the heaviest hay crop, while the earlier seedings of May 9 and 19 were the only oats that matured sufficiently to produce seed. Oats seeded on May 30 gave the better yield of hay and would have matured had it not been for the setback by the drought in June and July. The earlier seedings withstood the drought better than the later seedings, as the roots penetrated deeper into the ash and were able to gather moisture.

Hull-less barley seeded on June 3 headed and filled fairly well at 26 inches high. The seed was damaged during the winter in the storehouse, therefore a very poor stand was secured, but that which germinated made fair growth, was thrifty and of good color, and gave evidence that barley can be grown on the ash where the nitrogen is supplied.

Spring vetches seeded with the oats did not make sufficient growth to warrant further work with them on the ash. On hillside land, where the ash is incorporated with the soil, the vetches will make good growth, as was demonstrated this season on the tops of the hummocks where the ash and soils were mixed.

Rape seeded in the ash made little growth except where the roots were able to get through the ash to the soil below.

Turnips and rutabagas made slow growth in the ash that was given a liberal dressing of well-rotted manure. The plants lived through the summer, but made very little growth until late in September, and then their growth was fairly rapid. Turnips grew to 3 inches in diameter and rutabagas to 2 inches. The quality of the turnips was very good and of the rutabagas only fair. The latter seemed to be rather woody in texture.

Sand spurry seeded in the ash washed from the hillside made but little growth, but with a light dressing of manure it has made good growth and gives promise of usefulness on the ash where manures are used.

• VARIETY TESTS OF GRASSES AND CLOVERS.

On July 10 small plats of eight varieties of grasses and three varieties of clovers were seeded on well-prepared seed beds of volcanic ash. A portion of each plat was given a surface dressing of well-rotted manure, another portion received fresh horse manure, and still another portion was given a dressing of nitrate of lime at the rate of 100 quarts (about 300 pounds) per acre, while a fourth por-



FIG. 1.—PART OF TRACT MANURED IN 1912.

Sown to oats with 250 pounds nitrate of lime in 1913. Photographed August 30, 1913.



FIG. 2.—EFFECT OF FERTILIZERS. ONE DRILL WIDTH WITHOUT ANY FERTILIZER.

Oats heading at 4 or 5 inches.

RESTORING VEGETATION ON LAND COVERED WITH VOLCANIC ASH
ON KODIAK ISLAND.



FIG. 1.—SECOND BENCH MEADOW. NO MANURE, BUT 250 POUNDS NITRATE OF LIME PER ACRE.

Photographed August 30, 1913.



FIG. 2.—NATURAL RESTORATION OF REDTOP ON LAND FORMERLY TOO WET TO CUT.

Yielded 2 tons of hay per acre.

RESTORING VEGETATION ON LAND COVERED WITH VOLCANIC ASH
ON KODIAK ISLAND.



FIG. 1.—TEACHER'S GARDEN AT AKIAK, VIA HOLY CROSS.

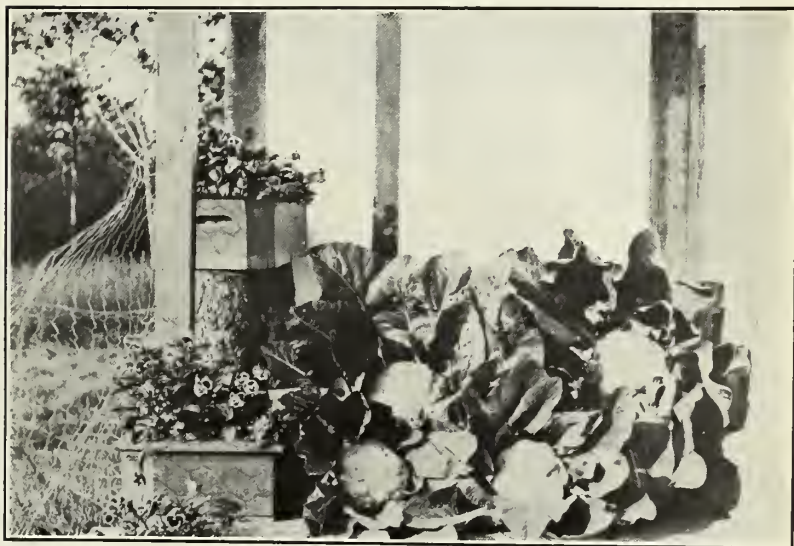


FIG. 2.—CAULIFLOWER GROWN AT AKIAK.



FIG. 1.—MITCHELL RANCH, KNIK. POTATOES IN FOREGROUND.



FIG. 2.—CABBAGE GROWING, MITCHELL RANCH.

tion was not treated. Plats of alsike and white clovers were treated with Mumford's germ inoculator.

The grasses and clovers came up quickly, but the growth was rather slow throughout the summer and fall. Final notes were taken October 1.

Bluegrass: Stand 95 per cent. On ash without manure grass lived but made little growth; one-half inch high and red in color; responded very little to nitrate of lime; manured plats show good color, and from 1 to 2 inches high; very little difference between well-rotted and fresh horse manure.

Creeping bent grass: Stand 100 per cent. Grew fairly well on ash and responded well to nitrate of lime; stands from 2 to 3 inches high on manured plats; a little in favor of fresh manure; color good.

Rye grass: Stand 33 per cent. Grew fairly well on ash; responds fairly well to nitrate of lime and stood well on manured plats; stands 2 to 3 inches high and of good color, and in favor of fresh horse manure.

Sheep fescue: Stand 85 per cent. Did fairly well on ash; $\frac{1}{2}$ to 1 inch high; responded well to nitrate of lime, but did best on manured plats, and in favor of fresh manure; color good and from 1 to 2 inches high.

Meadow fescue: Stand 100 per cent. Did fairly well on ash and responded well to nitrate of lime and well-rotted manure, but grew best on fresh manure; of good color and stood from 1 to 2 inches high.

Red fescue: Stand 15 per cent. Did only fairly well on ash and did not respond to nitrate of lime; on manured plats it stood well, but grew very slowly and was only 1 inch high; color good.

Redtop: Stand 100 per cent. Did fairly well on ash and responded well to nitrate of lime, but was a little better on manured plats, and in favor of fresh manure; color very good, and stood from 2 to 4 inches high.

Timothy: Stand 100 per cent. Did fairly well on ash, and responded to nitrate of lime, but did best on manured plats, and a little in favor of fresh manure; color good; from 3 to 4 inches high.

White clover: Stand 100 per cent. Did very poorly on ash, but the plants lived; there was but little response to nitrate of lime. On well-rotted manure plat the color was yellowish green, while on fresh manure plat the color was good, and the clover 2 inches high.

White clover (inoculated with Mumford's germs): Stand 100 per cent. Did very little on ash and responded but little to nitrate of lime; on manured plat it was noticeably ahead of the untreated seed; the color was better and the growth heavier, and the clover was 2 to 3 inches high.

Red clover: Stand 100 per cent. Grew slowly in the ash and responded noticeably to nitrate of lime, but on manured plats it stood from 1 to 3 inches high, a little in favor of fresh manure; yellowish green in color.

Alsike clover: Stand 100 per cent. Did but little on ash and responded fairly well to nitrate of lime; did best on fresh-manured plat, but the color was poor, and the clover was but $\frac{1}{2}$ to 1 inch high.

Alsike clover (inoculated with Mumford's germs): Stand 100 per cent. About the same as the untreated plat; no noticeable difference.

From the growth of the grasses for this first season the creeping bent grass seemed to lead all other varieties, both on the ash plats and on those manured and given dressing of nitrate of lime. Closely following this was the meadow fescue, redtop, and timothy. The stand was poor with both the rye grass and the red fescue, but these two varieties stood better than the other grasses. All varieties showed the effect of a lack of nitrogen in the ash.

Brome grass was seeded in the general mixture of grasses on all the meadows, but all the seed was mixed by mistake before the variety test was seeded; therefore a comparison with other grasses could not be made accurately.

The test of oats with and without fertilizer was made in the field by leaving one drill width without fertilizer well toward the center of the field. The contrast was noticeable from the first week after the oats came up and became more marked as the season advanced. The oats on either side of the unfertilized drill width received nitrate of lime at the rate of 240 pounds per acre, and superphosphate 33 pounds per acre. The growth of the oats on this plat was very slow throughout the season and showed the lack of nitrogen from the first week, but the plants all lived, and many of them headed out with from three to nine kernels which partly filled and ranged from 4 to 8 inches in height, while the oats on either side stood from 24 to 30 inches in height and made a fair yield of hay. (Pls. XI, fig. 2; XII, fig. 1.)

That there is available plant food in the ash was shown conclusively by the growth of the oats without fertilizer, while the lack of nitrogen was emphasized by contrasting the oats grown where the nitrogen was supplied. At the time of giving the fields the second dressing of nitrate of lime, portions of the drill width were given a dressing of 40, 80, and 120 quarts per acre, respectively. The change in the oats was apparent within a week, and at the close of the season there was no noticeable difference between that receiving 120 quarts and the rest of the field. The change in the color of the plants was remarkable, and within three weeks the red blades were changed to dark green, and the growth was rapid.

The tests with superphosphate, with and without nitrate of lime, gave evidence of beneficial results from using a small amount of superphosphate with the nitrate, but where used alone the growth was very poor, and the plants seemed to grow woody and ripen early. There was perceptible difference in the date of heading out where 50 pounds of superphosphate per acre was used with the nitrate, and the growth was at least one-third heavier than where the nitrate was used alone.

THE STATION HERD.

The herd of Galloway cattle belonging to this station was wintered at Toppenish, Wash., and summered on pasture at Chehalis, Wash., where they have done remarkably well. The increase of the herd for the past 12 months was 25 calves—14 bulls and 11 heifers. The losses for the year were 1 bull calf, stolen from the yards at Toppenish, and 1 heifer calf which died from injury received on the train in transit from Toppenish to Chehalis. The low percentage of calves during the 12 months was probably due to the unfavorable conditions caused by the volcanic ash.

The Galloway cattle have readily adapted themselves to the new conditions of climate and feed since moving them from Kodiak. All are thrifty and in fair condition to go into the winter.

Eight head of young stock were sold at Toppenish in the spring before moving the herd to Chehalis, and the herd at this writing numbers 101 head.

Some 60 head of the cattle are offered for sale at the present time. The better milkers and all their female offspring will be retained for the dairy at Kodiak. Those offered for sale are of the beef type and include a number of very good individuals. All the female offspring from the cows not showing very good milking qualities will be sold, because of the limited facilities for handling the herd, both at Chehalis and at Kodiak. The work of selection of cows for the dairy will be more rigid from year to year, until the poorer milkers are disposed of and a strain of heavy milkers is developed.

SHEEP AT THE STATION.

The sheep belonging to the station were wintered on hay shipped from the States. They were confined in a well-sheltered timber yard and allowed to run in or out of the barn as they liked. They were fed in the barn all the winter in order to save feed and to gather as much manure as possible.

The sheep came through the winter in good condition and were put on pasture May 6. Thirty-four lambs were dropped in May with a loss of but three. All the wethers, including the lambs, were sold

for mutton during the summer, also a few of the older ewes. They became infested with ticks from the rams shipped from the States, and it became necessary to dip the flock this year. The lime and sulphur dip was used with very good results. Very few ticks survived the dipping, and another year's dipping should eradicate ticks from the flock.

The sheep did unusually well on pasture the past season, and the wool crop was good and fairly free from sand or ash. The lambs made very good growth. All the sheep were fat and in prime condition on pasture November 3. At that date they were driven in at night and fed, and turned back on the range during the day. The flock now consists of 59 ewes and 2 rams.

SUGGESTIONS FOR FUTURE WORK.

From the results obtained in the work of growing feed for live stock on the volcanic ash at Kodiak and with the return of pasturage and normal climatic conditions, it is deemed advisable to return a portion of the herd to Kodiak during the coming summer. The work of building up the new soil rapidly will be greatly aided by maintaining live stock on the land. It is recommended that 30 mature animals and the calves of the herd be returned in June or July, and further, that the team kept with the herd be returned to Kodiak in the early spring for the crop work of the year.

It is further recommended that the station be fully equipped in the way of modern machinery to carry on the work and to place the station above the pioneer stage under which it has been struggling since it was established.

The need of a new hull for the launch is fully as urgent now as in the past and should be supplied as soon as funds are available.

The scope of the work of the station has so broadened under the new conditions resulting from the fall of volcanic ash that the problems of crop production are forced upon us if the station is to be continued.

Further experimental work with fertilizers should be carried on from year to year, as well as the testing of varieties of grains and vegetables.

Since nearly all the different varieties of native berries on the island were destroyed by the ash fall, the work of testing varieties of cultivated small fruits should be taken up this season.

LETTERS FROM SETTLERS AND REPORTS FROM THE SEED DISTRIBUTION.

The reader who is in search of information about Alaska is recommended to read the following letters from settlers scattered all over the Territory.

They tell the story of what each is doing in the way of farming and gardening in their respective locations.

Edith M. Kilbuck, teacher, Akiak Government school, Holy Cross post office, Alaska.—Now that the summer season is past and our work in the gardens at Akiak over for the year, I will report some of the results of our efforts, results that we are certainly proud of (Pl. XIII, fig. 1). In spite of the unusual dryness of the season the gardens thrived and matured good vegetables. The Petrowski turnip seed sent from your station was received and planted. It made a wonderful yield, and we consider it our finest turnip out of five varieties. It is sweet, tender, and of a beautiful shape and smoothness. It was the only variety that did not have some worms. We are now without seed for next year and would like a little for our own use. We have fine specimens from which to raise seed for the following year.

Other turnips raised were the White Egg, Yellow Swede, and several flat varieties. All varieties reached great size, many weighing 10 and 11 pounds, the largest one measuring 32½ inches around. I never saw such turnips, even in the States. The rutabagas ranged from 3 to 7 pounds. We sowed the seed in a cold frame and set them out. They, like the turnips, are of excellent quality.

From two rows of peas 30 feet long we picked 4 bushels.

We set out 54 Snowball cauliflower plants and raised 51 heads of as fine cauliflower as I ever saw. The heads were beautiful and measured from 7 to 11 inches across the solid part. From 108 cabbage plants set out we harvested 98 heads of excellent cabbage weighing from 5 to 12 pounds, trimmed heads, quality good. Some heads were rather loose, but most of them were solid and good (Pl. XIII, fig. 2).

Kale, Swiss chard, parsley, beets, radishes (both summer and winter), and lettuce of all varieties could not have been finer anywhere.

Our celery did fairly well, is tender and sweet, but because of lack of fertilizer it was not very tall. We hope to do better another year.

Our potatoes were sprouted in boxes in May, set out the first week of June, and we ate potatoes larger than hens' eggs on July 19. They are well matured and somewhat mealy, although not quite as mealy as potatoes shipped from the States. The yield was good. Twenty-five pounds of seed yielded 500 pounds of fine potatoes, some of them weighing 1½ pounds each. This was on an old village site turned over for the first time.

Rhubarb grows well, remaining out all winter and sending up shoots early in the spring. Seed planted this spring yielded large and tender stems for cooking in September.

Thus far I have been speaking mainly of the school garden. We have been teaching our people to raise their own vegetables, and this year there were 16 gardens besides our own. The natives are very fond of green things and worked enthusiastically in their gardens. They had fully as good success as we did in all they tried to raise and are rejoicing in well-stored cellars. They will have vegetables to last them till late in the spring. All the families are planning to enlarge their plats of ground before planting time comes again. They have sold about \$60 worth of produce and will try to raise some things for market next year.

The mice and rabbits are great pests, and they destroy a great many vegetables for us all. We can fence the rabbits out, but the mice are a problem which is yet to be solved. One patch of turnips on rather low ground raised a good many faulty turnips, black inside. Was it the wet? A few hills of potatoes rotted; that is the stems turned black and died right at the ground. The potatoes did not grow large in those hills, but did not rot.

Our first frost was on August 26, and we had several hard frosts the first week in September. We harvested late in September.

Hardy flowers do well. We have bluegrass and white clover growing in the dooryard.

The natives are being taught to can their vegetables and berries; make beet pickles for winter, and put up sauerkraut. Ten dozen Mason fruit jars were shipped in this summer, and many more will be ordered for next season. Our people really seem to be waking up. They are industrious and ambitious, following our advice readily and cheerfully. We are hopeful of being able to teach them many things in the near future. Our work is intensely interesting, and we enjoy it.

A. G. Swanson, Knik, Alaska.—I will try to tell you how my first attempt in farming succeeded. Everything I planted, such as kale, cabbage, carrots, beets, peas, lettuce, radishes, rhubarb, and the Petrowski turnip, did very well. The rest of the turnips and rutabagas were totally destroyed by root maggots. I planted potatoes on a very steep hillside, too steep to cultivate except by hand, but with a south slope and from 2 to 4 inches of ashes all over it. I planted 50 pounds each of Gold Coin, Early Ohio, and a white potato, name unknown. All sprouted in fine shape. They were planted May 10. On May 20 they were nearly all up, and early in June, when some of the potatoes around here were peeping out of the ground, mine were in bloom. The 1st of August most of the vines had turned yellow, and on August 27, when the first frost came, the vines were all down on the ground and the tubers fully matured. The yield was 1 ton of marketable size.

C. A. Berens, Hoonah, Alaska.—I will address a few lines to you to-day in regard to some seeds that you sent my wife last year. We planted all, or nearly all, of the seeds, and all came up; but as it was very dry for nearly a month, everything was backward, and for a spell it looked as if nothing would mature. However, rain came, and some of my garden stuff made a strong finish.

We had splendid carrots and fine rutabagas. Parsnips also did well. Now, we had three different gardens, and I planted a variety in each place to see which would prove the best soil, and in all of them the turnips came up all right and seemed to flourish for a time, but all got wormy. A little white maggot ate off the roots and raised havoc with them. I did not know what to do. I did put ashes around some of the cabbage plants (I saw my mother doing so 40 years ago, and I have not been on a farm or tried to raise a garden since. I have been mining in the interior for the past 18 years), but they did not amount to much.

Now, I want you to tell me how you get rid of those maggots. We put seaweed from the beach in every bed, and I blamed the seaweed for the trouble; but my wife thought differently.

We would like some more seeds, if you can spare them—carrot, cabbage, turnip, rutabaga, parsnip, and a package of kohlrabi. Those we had this year were very small, but they were very good. The little yellow turnip did the best of all my turnips, and if it had not been for those worms, would have made a fair crop. We planted some potatoes, too, but the bluejays dug the seed out of the ground after the plants were 4 inches high. Now, what do you think of that?

Henry Vermeire, Haines, Alaska.—I will endeavor to let you know what I have raised the past summer.

I came here March 26 and bought a half interest in my brother-in-law's (Joe Smith) ranch. After I was here two weeks, he went to Juneau to work with the teams. We have 135 hogs. Shortly after my brother-in-law went away

the cholera came among the hogs and I lost 93. At the present time they are doing well, and I have 78 left.

I planted 2 acres of potatoes, which looked very fine before they began to bloom, when they started dying off, and I lost about one-third of them. Still, I got a pretty fair crop. I got 106 sacks of marketable potatoes.

I also sowed 4 acres of rutabagas, which in some places made a good crop and in other places were not very good. I got about 700 sacks, of which I sold 410 sacks here and 130 sacks at Juneau and Treadwell, for which I got from \$1.25 to \$2 a sack.

I also put in $1\frac{1}{2}$ acres of oats, which I sowed the first week in May. It produced a pretty fair crop, but was about half smut. I would like to know what to do to prevent smut in oats.

I got three packages of peas of different varieties which came from the experiment station. They did very well. I also received carrot seeds and kohlrabi, which did fairly well.

I would wish to have some yellow turnip seeds; also a little of the half-long carrots and some of the best cabbage which is adapted to this country. I would also like a little cucumber seed and a few potatoes (Gold Coin), also a few gooseberry bushes. Also, I would like to know what kind of fertilizer to use for rutabagas. I will report the result of my crop.

I also have three cows, which I brought with me from Washington. They do better here than in the States.

I have plenty of flower seeds which I got from my neighbors.

Theo. Floren, Tuluksak, Kuskokwim, Alaska.—I received your letter of February 18, with two papers of turnip seed (No. 22755) inclosed; also a copy of the report for 1911. It got here May 2.

Part of the seed I kept for my own use. The other I gave to other parties. The result from the seeds was very good. A large percentage was over 4 inches in diameter. Some few seeds we got from Bethel Mission. Only about 10 per cent came up; the seed was probably old. Otherwise, vegetables do very well in this part of the country. Some people along the Kuskokwim River have what they call good-sized gardens—about 50 by 100 feet, or 100 by 100 feet, where in ordinarily good seasons they get several crates of potatoes and vegetables in abundance.

The turnips, kale, cabbage, lettuce, and radishes seem to do as well here as in many places on the outside. The long white radish was as good in the fall as in the early part of the season. Some grew as large as a good-sized carrot, and they were as good as any radishes I ever tasted.

I would be very glad to give you a description of the flora here, but I have been in the country for the past eight years and did not bring any books with me, so I am afraid I would mix it up.

Joseph L. Hill, Katalla, Alaska.—The seed potatoes, also annual report, reached me in due time. Please accept thanks for both.

The potatoes we planted and went strictly according to your specifications. While about 25 per cent of them did finely, owing to attacks of some small insect on the vines just at the root, the rest were very poor. This insect seemed to rot the vine where it enters the ground and stopped all growth just as the small potatoes began growing. We will have about 200 pounds of good seed, though, for next season.

Our turnips and cabbage could not be better. I never saw better anywhere. The cabbage ran from 2 to 6 pounds, and the turnips pretty much the same.

Could you supply us with some of each of gooseberry, currant, and raspberry plants? If so, send the kinds you think will do the best. We have both alder-flat and hillside land to plant them on.

Fred Liljegren, Ellamar, Alaska.—I am writing you regarding my garden. Lettuce, radishes, and onions did well, also carrots, kale, and white Dutch turnip. The white turnips did well wherever I planted them. Parsnips and rutabagas did not do very well. Potatoes did very well, considering the seed potatoes we had.

Taking it all in all, we did very well, as the ground had not been worked for some years, having had berries on it.

I planted some apple seeds and have five trees about 8 feet high, but no signs of blossoms. Could you give me some information regarding them?

F. R. Shaver, Government teacher, Klukwan, Alaska.—Mr. Falconer has turned your letter in regard to the Klukwan gardens over to me to answer, as I have been in charge of them during the past summer. I find the work along that line very interesting.

Tomatoes were planted in hotbed May 2 and transplanted to the garden June 13. About half of them were covered with cheesecloth to see the effect it would have on their growth. The plants covered with the cloth were about a third larger by the time the frost came and were well filled with fruit, some of which was just beginning to turn September 1. The plants were covered at night from this time on with light quilts, but the fruit had to be picked the last of the month and ripened in the house. The plants not covered with cloth had no fruit on, as the blossoms fell off. I will try some more next summer and will have the plants larger at the time of setting out.

Early Minnesota corn was planted May 21 and grew well until killed by frost September 2. At the time it was killed it was $5\frac{1}{2}$ feet tall and had ears about 5 inches long that were just turning into the milk. If we could have had two more weeks of good weather most of it would have been ready for use. Cheesecloth was used on a few hills, but the corn did not show very much difference by the time it was killed.

Onion seed was planted May 19 and did well. The largest at the time of harvesting were as large as a half dollar. Set onions do really well here.

Cucumbers were planted May 21, but on account of wet ground they did not do well. Small cucumbers $1\frac{1}{2}$ inches long formed, but they did not grow any larger, as they were too wet from that time on.

The apple trees we received from you last spring all grew as well as the other plants except the gooseberries and some of the strawberries. I think they were in the office too long before being brought out.

Radishes, lettuce, cabbage, cauliflower, kohl-rabi, turnips, potatoes, and rutabagas do as well here as anywhere. Also beets, carrots, and endive.

O. M. Grant, Flat City, Iditarod, Alaska.—In regard to the package of Petrowski turnip seeds, I sowed them, not thinking very much of them, and they surprised me. Some of them weighed $5\frac{1}{4}$ pounds, and the yield was good. I had six different kinds and Petrowski beat them all, and there were no root maggots on them when the others were eaten up with maggots. They are the best turnip for this country by far, and if you have a couple of packages to spare I would be pleased to have them, with many thanks.

I also had a great yield of potatoes, the best I have had in this country for years. Some of them weighed over 3 pounds, and they were dry and firm. They were the variety Burbank.

I have prepared 2 acres for next year's garden and will have more variety.

Rev. Paul Shadura, Kenai, Alaska.—I did not let you know about the results of my last fall's garden, as I was out in southwestern Alaska. Now I am at home and am writing you about it.

Cabbage (Jersey Wakefield) was very fine, 6 pounds a head. Rutabagas weighed 8 to 9 pounds each. The carrots also were O. K.



FIG. 1.—MRS. W. M. CONLEY'S FLOWER GARDEN, VALDEZ.



FIG. 2.—J. P. RICKERT'S MARKET GARDEN, FAIRBANKS.

I did not have enough seed (cabbage), so I would like to get extra packages of Jersey Wakefield and Dutch Flat, also Petrowski turnips.

Fred S. Willson, Wrangell, Alaska.—The following is a report of the results of my garden, which I take pleasure in submitting: Please accept my thanks for the Gold Coin and Early Hamilton potatoes you sent me last spring. Both grew well and produced a heavy crop, better than any kind I had tried yet. They were sprouted and planted over a row of manure.

Radishes of all kinds did well, and I had a good crop of lettuce. I have had the best results so far with the Hanson head and Black-Seeded Simpson. Have had better results with Early Jersey Wakefield cabbage than with any other kind and expect to plant a larger crop next year. Turnips and rutabagas produce a good crop with very little attention. I did not make a success of celery but may do better next time. Rhubarb and kale both grew to be big, healthy plants. I have plenty of carrots and parsnips from two small beds.

The results of my work lead to the conclusion that a garden must be well fertilized and drained to produce good crops in southeastern Alaska.

M. E. Russell, Juneau, Alaska.—The apple tree you sent me in 1905 has grown to be about 9 feet high. It bore 15 apples this year which matured. They were a rich golden yellow, and some of them measured 7 inches in circumference. I think they are of the Bellflower variety (Yellow Transparent). They were mellow and juicy, and of a very good flavor. After being off the tree several days they got quite soft and dry.

The tree is planted in gravelly ground and has had no particular care, but it looks very thrifty.

Jos. P. Follman, Deering, Alaska.—I write to make report on results from planting Petrowski turnip seed No. 22755, as per your request.

I must say that turnip is the finest vegetable we have ever raised in here. Some reached a weight of $2\frac{1}{2}$ pounds and remained firm, sweet, and of fine flavor, elegant eating raw or cooked, and splendidly adapted to this country.

Your other seeds came too late for planting this season. I will render you a report next summer. I have made arrangements with an experienced truck gardener, who will advise me of the success he has with each vegetable, and I will acquaint you with his data. This man's name is Frank Aquino; if you will kindly add him to your mailing list, you will have an expert on your staff, for he thoroughly understands all phases of gardening.

I wish to call your attention to a radish we had in here this summer. These seeds are put up by the Seattle Seed Co. It is called Early Scarlet Turnip White Tip radish. It is the finest radish we have ever had in here; thrives greatly, grows to good size, does not become pithy or woody from remaining long in the ground. It is a fine, firm, edible vegetable, and if you have any seeds of that variety please send us some, and greatly oblige.

A. Hirvela, Knik, Alaska.—This year I have a more favorable report to send you than I had two years ago. Last year I did fairly well in my gardening, though it was an unusually rainy summer. I planted 200 pounds of potatoes and raised about a ton. This year I planted 300 pounds in several different patches of ground which measured about 11,000 square feet, and the yield was about $2\frac{1}{2}$ tons, nearly all fair-sized potatoes. Some of them weighed $1\frac{1}{2}$ pounds.

Turnips of all different varieties did well, both this year and last year; some of them weighed 8 pounds. Rutabagas also did well. The largest of them weighed 7 pounds. Cabbage, cauliflower, and Brussels sprouts did not do very well. Beets, cress, kohlrabi, lettuce, and radishes did very well. This was all in the ground where two years ago I could raise nothing. I have used fish guano as a fertilizer, and that is the only thing I could get here.

I tried also carrots, beans, and onions. They all came up, but did not grow well. Peas did better, but were killed by the frost of September 4.

Out of 24 apple trees I received in the spring of 1911 10 have died. Some of them died this spring, I believe, on account of mice having been at them during the winter. They gnawed all the bark off around the trees near the ground. The growth of the rest of the trees seems to be rather slow, their height being from 18 inches to 3 feet.

Out of 200 strawberry plants received in 1911 only 10 survived. I let them grow wild last summer in order to get some more new plants out of the runners. I replanted some of them last fall just before the freeze-up, and they all came up in the spring and had a number of blossoms and fruit in July; some of them were of large size, and they had a very sweet flavor.

Red raspberry bushes grew very fast and thick this year. Some of the canes were over 6 feet high and yielded many blossoms and fruit.

Currants and gooseberries have been growing fairly well, too, but neither of them bore any fruit.

Plate XIV shows some products grown at Knik.

Steve Ragan, Haines, Alaska.—I desire to report on my garden experiments for the year 1913, and thank you for the seeds you sent me last spring. I also want to thank you for the report of the work for 1912, which I very recently received.

My garden was on the back part of two lots, or about 100 by 80 feet. My total expense, counting all seeds except those you sent, also counting the expense of hiring the ground plowed and all outside help during the summer, was \$12, while the produce reaped was easily worth \$60. My work was done at odd times and was recreation after work done in my office.

My potato crop was my most successful crop. My patch was about 80 by 40 feet. One-half of one row was planted in the seed you sent me last spring, Burpee Superior, and these were by far the best potatoes I had, both in yield and quality. The balance of my patch was planted in Anway Early Alaskan, a potato crossed by Mr. Charles Anway, our pioneer rancher. The latter is a pale pink-skinned potato and a good one. On the whole patch I gathered about 32 bushels. On the half row in Burpee Superior I gathered 2 bushels. If I had had the whole patch in this variety and the yield had averaged the same I would have had 48 bushels instead of 32, or about 625 bushels per acre. We cooked a few of these, but saved the most for seed for next year. They are dry and mealy and cook very quickly, and will be a great seller on the market, as they are a good size and smooth and uniform. I think they are better than the Irish Cobbler, and that is going some. Potatoes were all planted April 28. We had new potatoes August 1. They would have done just as well planted three weeks later.

Cabbage could have been better, i. e., it was not as good as that of some of my neighbors. Mr. H. O. Banta had the prize cabbage, one weighing more than 32 pounds. Had good string beans from Golden Wax (Lilly) seed. From three other kinds received no results. Edmund Blood Turnip beets did well. I planted Chantenay and Danvers Half Long carrots. Both did well. I would recommend the long ones. Endive, kale, kohl-rabi, lettuce, and salsify did fine. My onions were the best I have seen in Alaska. During the summer I experimented with tomatoes, cucumbers, and corn this year. The two former I kept covered. The first planting died from the effects of some insect, and the other planting came on too late. I was encouraged in my experiments with all. The corn was British Columbia "squaw corn" and had tasseled and put out nice silks when the frost came. This was the earliest frost we have had in years. It came September 1.

One of the greatest treats of the season was our peas. We had peas from June 10 until the heavy snow covered them and they were frozen solid. The first frost killed only the top of the Tall Telephone. All others were killed outright. I planted Alaska, Horskford, American Wonder, and Tall Telephone. All produced good results, but the last named are the best for all uses.

The only turnip I have found to do any good, from all standpoints at least, is the yellow turnip. Either the Petrowski No. 22755 or the Yellow Aberdeen is good. The former is preferable.

This locality shipped to the Seattle markets this year over 1,000 sacks of yellow turnips and rutabagas. There have also been several tons of cabbage and potatoes shipped from here. The turnips and rutabagas brought the producers \$1.25 per sack, and the sacks furnished f. o. b. wharf at Haines.

My flowers did beautifully this year. I think the poppies were the most beautiful. The calendula and the pansies were the most lasting, and wife has some in the house to-day which grew out of doors.

I appreciate all the seed you sent me and will appreciate any sent in the future. Will try anything according to your directions that you desire to have tried here.

Mrs. W. M. Conley, Valdez, Alaska.—Seeing so many nice photos of gardens from southeastern Alaska in the Agricultural Report for 1912, and not one from southwestern Alaska, I inclose one of a small portion of my garden in Valdez. (Pl. XV, fig. 1.)

I saved some seed from the early Michigan potatoes you sent me; sprouted them, planted them June 2, dug them October 10, and on a patch 20 by 30 feet I raised about 800 pounds of fine large potatoes, some weighing $1\frac{1}{2}$ pounds.

I found Blue Bantam by far the best pea I ever tried here. They are fully as early as the Alaska and are almost invariably filled with nine or ten beautiful, large, wrinkled peas.

Spinach, chard, carrots, parsnips, lettuce, kale, cabbage, and cauliflower all do well here, although cabbage and cauliflower are bothered a good deal with the root maggots. Beets do fairly well, although they are inclined to run quickly to seed. Turnips, rutabagas, and radishes are almost a total failure on account of root maggots; always excepting the Petrowski turnip, which they bother very little. Salsify grows long and rather slight to be of much value. I have celery, parsley, sage, summer savory, and sweet marjoram about every year.

In flowers I raise quantities of nasturtiums, sweet peas; Oriental, Iceland, Shirley, California, and double poppies; stocks, golden glow, snapdragon, asters, bachelor's button, candytuft, pansies, marigolds, forget-me-nots, daisies, schizantha, linum, nemophila, and many other kinds.

I should like very much to get one or two hardy apple trees to try next year, and thank you for the seeds you so kindly sent to me.

C. E. Burr, Seward, Alaska.—I thank you for the seeds you kindly sent me last spring. I had wonderful success with the Petrowski turnips, the largest ones weighing 4 pounds. They are the smoothest and most beautifully waxlike of any vegetable I have ever seen, and such a small taproot. I think it is the color of the Petrowski turnip that protects it from the maggots, for I have observed that color has a great deal to do with it. All yellow-fleshed turnips are freer from worms than white ones, and the white ones are freer than the crimson ones. My Red Lily turnips were destroyed, fully 99 per cent, by maggots. Of the white varieties about 25 per cent were destroyed, and of the yellow varieties not over 5 per cent.

Carrots did well, and beets were the finest ever. Parsnips and lettuce were excellent. The worms got most of my first and second planting of radishes, but

I had some very fine ones that I planted on August 7; crispness and flavor unsurpassed.

I was somewhat disappointed in the potatoes, as the frost in August cut the vines down. I see in the press that the department has obtained some frost-proof potatoes from New Zealand, and if you could spare me a few I would be very thankful. We could raise good potatoes here if it were not for the early frosts. The weather was too dry in the forepart of the season, but after the rains the last of July everything made up for lost time.

A. C. Goddard, Haines, Alaska.—The apple trees and fruit bushes you sent me arrived in good condition and were planted on May 18. They all did well with the exception of three of the raspberry canes, which died.

Brussels sprouts planted April 24 formed sprouts just over 1 inch in diameter. Onion seed planted May 21 made bulbs about $1\frac{1}{2}$ to 2 inches in diameter. Cabbage seed planted outdoors May 23 formed small heads. Lettuce, radishes, beets, peas, parsnips, parsley, carrots, rutabagas, and turnips did fairly well. Beans, as usual, were a failure.

The root maggots did not bother the turnips much this year, but they concentrated all their energies on the cauliflowers, with the result that there were none left for me. They evidently prefer cauliflower to cabbage, as both grew in the same patch and not a cabbage was touched.

I was also bothered by a small brown-winged beetle which came off the fireweed and devoured the buds on the potato vines. It also ate some of the leaves on the apple trees and strawberry plants. I suppose I will have to spray next year.

We had a frost here about the middle of August which nipped the peas and the potato vines, and about September 1 another frost killed everything. Consequently the potatoes were not very large, but they are of good quality.

The Petrowski turnip is earlier than the white varieties, and besides being almost exempt from the attacks of the root maggot, is very sweet and tender. I will set some out for seed next summer. I saved a quantity of turnip seed this summer from turnips which grew out all winter; also some kale and radish seed.

Alfalfa sowed on June 6 was up on June 13, but did not do very well except where it was shaded by weeds. There it attained a height of 1 foot. If it survives the winter I will sow another small patch in the spring with oats as a nurse crop.

On the whole, the garden did not grow as well this summer as it did last year, but in Klukwan there were some very fine gardens. When one sees tomatoes, cucumbers, and corn flourishing outdoors, as they were in Klukwan last summer, it encourages to further effort.

Thos. W. Hanmore, Iliamna, Alaska.—Considering the extreme drought that prevailed here throughout the summer months, and the number of light frosts we had during the growing season, the few gardens in this section were on the whole a success. At Iliamna we had two light frosts in the early part of May. On June 3 it frosted heavily enough to nip the young potato vines; again on August 14 heavily enough so that some of the potato vines never blossomed. On September 3 the thermometer went 10° below freezing, and several times during the month lower than that, the mean for September being 34.16° .

The rainfall at Iliamna was not measured, but probably did not reach 3 inches from May 1 to September 22.

On that portion of the garden that was watered there was a fair yield. Some few turnips reached a weight of 5 pounds, rutabagas 6 pounds; about one-half of the potatoes were of medium size, and some of those that were native seed

and were sprouted before planting came so near maturing that they were about separated from the roots as found in the hills.

The ground planted to turnips was new, sour, and acidulous, very full of roots and rocks, and was a failure principally on account of the extreme drought. My cabbage was a failure. I succeeded with beets, lettuce, radishes, and some parsnips.

The native gardens were a failure, as the owners were mostly on the Bering Sea at the canneries, and their small garden patches burned up from having been planted too thickly and the effects of the drought. J. D. Kinney, on the north shore of Lake Iliamna, is reported to have had a fine garden. He sent me two sample parsnips $12\frac{1}{2}$ inches in length, with a circumference of $6\frac{5}{8}$ inches.

The reports of the gardens on Lake Clark are good. In those gardens that were watered the vegetables were large, and the yield was also large. One hill of potatoes was reported by Mr. J. W. Walker to have yielded 104 potatoes, and he reported cabbages to weigh 10 pounds. On his way out he exhibited some yellow turnips grown from the sample package of seed sent in through your department that were very fine, weighing upward of 4 pounds, very solid and smooth, with an excellent flavor.

There is an embayment of Iliamna Bay known as Cottonwood Bay. It has an eastern exposure to the sun. The mountains are very steep surrounding. There are a few hundred acres available, well sheltered from the winds, and the reflection of the sun's rays during the day, with the warmth imparted to the rocks, causes a humidity throughout the night. Dogfish is plentiful and easily had. The Duryea brothers, who live there, have made generous use of the fish as manure, and they report excellent yields of potatoes. I received the seeds and distributed same to the natives. They do not care for any of the seeds except the turnips and rutabagas.

Ralph C. Vrooman, Seward, Alaska.—The following is a brief statement of the success I had with the seeds you kindly sent me last spring:

The radishes, both Half Long Scarlet and the Scarlet Turnip Whitetipped, grew to perfection. I could notice no difference in the quality or the growing of the two varieties. I got three crops from the same ground during the season. The first crop was by far the best, leaving the worms out of the question, which seemed to bother the last crop the most.

Lettuce, the Black-Seeded Simpson, the California Cream Butter, and the Prize Head, all grew to perfection. The first-mentioned variety proved to be a large, very tender, and light-colored leaf, somewhat curled, and for early use was my favorite. The second-mentioned variety proved to be a dark-green, straight leaf, and quite bitter. I did not like this variety until quite late in the season, when it developed hard heads almost like little cabbages, the leaves inside these heads being almost as white as cabbage. The inside leaves of this variety proved to be the best lettuce of the three varieties. The last-mentioned variety (Prize Head) did not prove worthy of the name, as it never showed any signs of heading. However, it was a good lettuce, of large, brown, curly leaves.

Carrots, the Joaquin, the Scarlet Horn, and the Chantenay, all did well, the first-named variety being the smallest.

Parsley, Moss Curled, did well, but never got very large.

Turnips, Early White Flat Dutch, all those which escaped the worms did exceedingly well, some reaching a diameter of 6 inches. However, about half of the plants began to die when about half grown on account of the worms.

Greens, endive (Green Curled), kale (Dwarf Curled Scotch), and kohlrabi (Early White Vienna) all did well, the first being by far the most tender and best tasting green, also the earliest and latest green, being good after several

frosts. The second-mentioned green was second in quality and was also quite a late green. The last-mentioned green we could not use on account of its toughness.

Onions, Southport Red Globe and Australian Brown, both looked very promising, but neither got large enough for much use on account of the short season. The former variety did the best, as it grew the larger and a greater percentage of the seed came up.

Rutabaga, Purple Top Yellow Globe, did fairly well, the tops growing very rank in spite of the numerous worms in the roots, which I believe stunted the growth of the roots.

The cabbage did fairly well. About half of the plants developed heads from 5 to 12 inches in diameter. They were all rather loose heads, but good tasting. This was the Early Jersey Wakefield variety. The roots of the cabbage were also badly eaten by the worms.

Brussels sprouts developed into very rank and promising plants, but none of them matured so that they could be used, on account of the short season.

Beets, Edmunds Blood Turnip and the Extra Early Egyptian, did not do very well, but the former came nearer reaching maturity. Half of the plants developed no roots to speak of. The other half developed roots from 1 to 2½ inches in diameter, but very few were of the latter size. What there was of them was good tasting.

Cauliflower (Snowball) was very satisfactory in spite of the roots being bothered by the worms. The roots of none of the plants escaped the worms entirely. Those that were only slightly bothered developed heads 9 inches in diameter. Seven-inch heads were quite common.

The worm I speak of was a small white worm, the largest of them being about one-eighth inch in diameter and one-half inch long. They worked on the roots only. The carrots and the beets were not touched by them, and the greens and lettuce were very rarely touched by them.

Candytuft (mixed *Iberis amara*) grew to apparently full size, but the flower remained a greenish color and had very little fragrance. Poppies, single, out of one package of seeds only five plants came up. They were very rank growing, from 2 to 3 feet high, some having a stock an inch in diameter, with very large leaves and flowers, some white, some red, and some red and white mixed. Each stock gave from 4 to 12 flowers. Sweet peas (*Lathyrus odoratus*) developed into very rank and promising plants about 4 feet high. Just before frost they had about a half-dozen flowers with many buds. The season was without question too short for this variety. Pansies grew to perfection, except that the flowers were rather small. When the plants were transplanted into the open they were set nearly a foot from each other, but before the end of the season they had spread out into almost one. The flowers were of various colors, nearly all dark. Some were actually black. Dwarf nasturtium (*Tropæolum minus*), none of the seeds came up. Asters were planted in the house, and only a few of the seeds came up. All died shortly after transplanting. Chinese pinks (*Dianthus*) were planted in the house and required a great deal of care, not only in the house, but also after transplanting, on account of the stock being so slender. It was not until they had been out about three months that they showed signs of being able to take care of themselves. At the end of the third month a few of them began to bloom very slowly. The flowers came in clusters, some white and some pink clusters, and some pink-and-white clusters mixed, very fragrant. Another month of warm weather I am sure would have developed some beautiful flowers.

The remainder of your seeds I did not give a trial on account of lack of space. With those I did plant I followed the directions on the envelope as

nearly as possible. The ground selected was mellow and had a small amount of compost on it. It was in a sunny place, but somewhat exposed to the wind from the salt water. A portion of the ground worked was new ground, and I was surprised to see that this new ground produced better than the ground that had been worked for several years. Considerable decayed wood existed in the new ground.

D. W. Burridge, Juneau, Alaska.—I received the seeds you sent me and thank you very kindly.

I must tell you about the strawberries you sent two years ago. I raised about 6 quarts of fine, large berries last summer and picked the first on July 4 and had a heaping plateful of as fine, large berries as I ever saw. I raised plenty of raspberries.

My apple trees are looking good. Just a few of them did not do well, but most of them are growing splendidly and are in perfect health and thrift.

I have about 10 acres now that is practically cut off, and am ready for burning brush again this spring. Am busy at present blowing out stumps, and things begin to look good.

J. R. Dodson, Circle, Alaska.—Tomato seeds were planted about May 15, 1913, in tin cans in the house, then transplanted to a hothouse constructed as follows:

About 19 inches of rich manure was covered by a foot of earth and a frame built over same. The frame was covered on all sides and top with glass. During the cold nights a lighted lamp was placed inside, and during the daytime the top was opened and the sun was allowed to shine in.

About July 15 the tomatoes had started to ripen, and by August 1, I was getting 10 to 12 ripe tomatoes every two or three days from seven plants. Some of these tomatoes were the size of good big oranges, while most of them were a little larger than hens' eggs, this being caused by lack of proper trimming of the plants.

Frank Slaven, Woodchopper Creek, Eagle, Alaska.—The seed which you sent me last year did splendidly. I had spaded up the fall before about 100 by 125 feet square, and April 28 I planted a portion of the seeds. At that date the ground was thawed about 2 inches. On the following Sunday I planted again, but the first planting was far ahead all summer in everything.

I had as fine lettuce, radishes, peas, turnips, and rutabagas as ever grew out of the ground. Some oats ripened here. Potatoes do pretty well. The flowers were also a success.

This is quite an old camp, but the last two or three years is the first time that anyone has tried to raise any vegetables, and it is quite a help. If we would not raise them, we would not have them at all.

I have made a patch ready for next year, although last summer was an exceptional one for growing stuff, as there was no early frost.

A neighbor, Mr. Darlington, also had a fine garden and the prettiest beds of flowers you would wish to look at.

E. Chesworth, Steel Creek, Alaska.—I received your seeds and have done some experimental work for my own use.

I inclose some turnip seed I think you will find better than anything you have so far. I went outside early and had to cut it down early and hang in the cabin. I have just returned. I have grown and used this seed for eight years, and have tried others and found nothing like it. The foliage is like rutabaga. The flesh is yellow and firm. I have never had a hollow or woody one. They have grown on poor soil as large as 6½ pounds. It will keep in the cellar until June, when it starts to rot. It rots in dark spots. You can cook it like other turnips, then cut in cubes and fry brown; or you can cook like pumpkin and make pies and not know the difference.

I have raised parsnip and carrot seed, but failed to raise onion seed. I sow the onion and parsnip seed on the frozen ground in spring, preparing the ground in the fall, and cover the seed with soil I keep in boxes and thaw out in the spring, and I have had good results. I also sow onion seeds in the summer for sets and plant in the spring.

No worm has bothered this turnip so far.

Nels Knutsen, Hoods Bay, Alaska.—Should have written you long ago, but wanted to see how the apple trees and berry bushes came out.

All the apple trees pulled through O. K. Every one of them is doing finely so far. There are a few of the berry bushes that did not come through. Otherwise they seem to thrive well. When I get some more fence put up I would like to try some more berry bushes. When I wrote last spring I did not explain about changing the ground. The ground has been changed, but I do not know how often. It seems the weeds are growing very fast, but what makes them grow so fast I do not know. Neither do I know how to check them. This summer things grew very fast, and then all of a sudden something seemed to check the growth. Perhaps it was too much water at one time; but it surely made the grass grow. I only got half of it planted, so the other half will seed the ground. I am willing to believe it will require long experimenting to find out conditions here.

The potatoes did fairly well. Oats also did well. A few carrots did first-rate. Cabbage was growing, but did not form, and then died out except a few. They partly headed, but are slow.

I am going to get good seed for a garden next year and see if it will work.

J. C. Carson, Katalla, Alaska.—I wish to thank you for the seeds you sent me last spring. Most of them did fine. This was true especially of the turnips, lettuce, cabbage, kale, radish, carrots, peas, rutabagas, and potatoes. Beets did moderately well. The potatoes grew splendidly until about the time they came into blossom. Then there was something that attacked the stems at the surface of the ground and killed most of them. I was not sure whether it was a bug or a worm, as I found both on the vines—a white worm about half an inch long and a little black jumping bug about an eighth of an inch long.

I sprouted the potatoes in the house. Part of the seed came from Skagway, and I think they were Gold Coin. The other seed came from outside; I got it at the store. It seemed to be scaly or scabby, having a sort of rusty spots. The Skagway seed was much the better.

The Petrowski turnips did splendidly. There was not a blemish on them. The white ones did well also, but the worms got into them pretty badly.

The rutabagas and peas grew fine. But the mice or moles practically destroyed them in spite of all we could do. They also bothered the cabbage and carrots.

I raised 9 sacks of potatoes, 15 sacks of turnips, 2 sacks of carrots, 2 sacks of rutabagas, and 75 heads of cabbage.

Everything is keeping well in the root house except the cabbage, which is rotting badly.

We had lettuce and radishes in abundance. In fact, we gave them to everyone that came around.

E. E. Rudolph, Seward, Alaska.—As it is coming toward seedtime again, I want to thank you for seeds and plants sent me last year, which did remarkably well.

The strawberries grew to immense size, but never bloomed. Can you tell me what I can do to cause them to fruit this year? They are well covered, and I think they should be in good condition. Others here have also tried to raise

strawberries, but all have failed in getting them to bear fruit. We are anxious to prove that they can be made a success at Seward.

The Gold Coin potatoes you sent us did splendidly, and that on virgin soil. The Early Ohios were also fine. The small, yellow turnip seed produced a big crop of fine flavor. We grew cauliflowers 14 inches in diameter, the finest I ever saw, and cabbages that weighed from 4 to 10 pounds each, white and quite solid. We have plenty of potatoes, rutabagas, carrots, beets, and cabbage to last until spring, nearly all of which were grown from your seeds.

The roses you sent did not grow. We have four apple trees that look fine, but I do not think they will ever bear. They just grow. We have about 100 red raspberry bushes set out in June, which bore quite well.

Martin Larsen, Afognak, Alaska.—We had a very late and cold spring, and I did not plant my garden until after the middle of June. It is the first time I ever had such fine vegetables. Everything was good. I had the soil and ashes well mixed and manured. The flowers were something beautiful indeed.

S. J. Marsh, United States Commissioner, Chandlar District.—The following details bearing on the possibilities of stock raising in the Yukon Valley, and which are facts worked out by practical experience and which have come under my personal observation, may be of interest.

In the fall of 1911 Mr. J. A. Reiger, living on the road from Fairbanks to Circle and about 15 miles from the latter place, brought in from the State of Washington 26 head of young cattle. Mr. Reiger, who is a road-house man, had had no experience in cattle raising, but believed that stock could be wintered on the native hay or swale grass by converting it into ensilage. The venture was therefore an experiment.

A silo built of logs, calked with moss and pointed on the inside with cement, was constructed on the bank of a small creek which flows into Birch Creek, near the road house, and on the head of which were large natural meadows. This coarse wild grass was cut and thrown loosely into the creek, floated down as logs are driven, caught by a row of stakes driven across the creek, and hoisted into the silo and rammed tight, a small amount of salt being mixed in. In a few days fermentation began, and as the contents settled the silo was again filled from time to time until it was full of the fermented product.

The stock grazed their own living until October 12, at which time the real experimental part of the venture began. Without having to acquire a taste these cattle licked up every drop of this fermented product which was offered them. They were fed on this alone from this time until about April of the following spring, at which time the silo was empty, and imported baled hay had to be purchased. Up to this time the stock were fat and in good health, an ordinary log barn having been provided for them to go into in the extreme winter.

At the present time Mr. Reiger has 45 head of as fine cattle as can be found anywhere, and at no time since the latter part of the first winter, when the ensilage gave out, has any feed been imported and practically nothing fed but this swamp hay converted into silo feed.

The importance to Alaska of this successful experiment can be better appreciated when we consider the vast area in the Yukon Valley alone, which furnishes large quantities of this native grass. The entire Yukon flats from Circle to Fort Hamlin and nearly 100 miles in width furnishes hundreds of these natural meadows. On the north side of the river from the Chandlar to the Hosana, and embracing the Orensic drainage, an area of over 2,000 square miles, through the center of which runs the Government road, from Beaver on the Yukon to the Chandlar mining camp, is dotted with small lakes and large

meadows capable of feeding hundreds of cattle, while the low ridges between, covered with a light growth of cottonwood, consist of a sandy loam which will produce anything which grows elsewhere in Alaska, particularly beets, turnips, and oats, wheat, and barley hay.

Here, then, are opportunities for stock raising north of the Arctic Circle, the proof of which has already been worked out on the ground by actual experience and by a miner who knew nothing of the business and whose sole capital was only sufficient to buy and ship in 26 head of stock.

WEATHER RECORDS.

The following report on the weather is based on a daily record, and all the records for each month are condensed into a single line.

Under the heading "Temperature," the mean maximum is the average highest temperature recorded for each day during the month to which the figures refer. In like manner, the mean minimum temperature is an average of all the lowest temperatures that were recorded for each day during the month. The daily mean is an average of these two figures.

Total precipitation means the number of inches and fractions of an inch of moisture, including both rain and melted snow, precipitated during each month.

The remaining four columns are self-explanatory. They record the number of days in each month of the kind of weather at the head of the column.

If the reader will consult a map of Alaska, each station can readily be located by its latitude and longitude. A careful study of these figures will enable one to get a fairly good idea of the climate at the places named during the year 1913.

Condensed meteorological reports.

ALLAKAKET. Latitude 66° 45', longitude 151° 10'. Effie L. Jackson, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1912.	° F.	° F.	° F.	Inches.				
December.....	-15.4	-34.7	-25.0	0.63	17	.....	14	5
1913.								
January.....	-29.1	-46.1	-37.6	.30	25	.....	6	5
February.....	8.1	- 9.2	- 0.6	1.08	12	3	13	10
March.....	15.6	-17.7	- 1.0	.50	25	2	4	4
April.....	31.7	- 1.9	14.9	.10	23	6	1	3
May.....	55.3	29.6	42.4	.70	13	12	6	6
June.....	75.1	43.0	59.0	.15	22	6	2	1
July.....	72.8	42.3	57.6	.49	15	9	7	5
August.....	57.7	37.4	47.6	2.81	7	12	12	14
September.....	46.1	26.5	36.3	1.87	9	8	12	19
October.....	24.2	4.5	14.4	1.63	14	6	10	2 12
November.....	3.9	-17.2	- 6.6	1.01	11	1	18	11
December.....	- 5.3	-29.7	-17.5	.67	15	5	11	16

¹ Sept. 12 omitted.

² Oct. 7 omitted.

Condensed meteorological reports—Continued.

CALDER. Latitude 53° 8', longitude 132° 27'. John McCallum, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
January.....	29.6	20.6	25.1	10.40	10	5	16	20
February.....	38.3	28.6	33.4	5.30	7	12	9	14
March.....	40.9	26.8	33.8	8.45	12	5	14	15
April.....	44.1	31.3	37.7	10.30	2	15	13	26
May.....	51.9	35.8	43.8	8.43	7	15	9	22
June.....	57.8	41.3	49.6	4.31	5	13	12	18
July.....	59.9	43.3	51.6	7.50	7	10	14	16
August.....	60.8	41.1	51.0	7.47	10	12	9	14
September.....	54.5	38.5	46.5	20.75	1	15	14	25
October.....	47.8	31.5	39.6	16.35	3	10	18	24
November.....	40.8	29.3	35.0	19.95	1	10	19	27
December.....	40.8	29.0	34.9	15.60	4	12	15	21

CANDLE. Latitude 66°, longitude 161° 50'. R. S. Dimmick, observer.

1912.								
December.....	— 1.5	—17.5	— 9.5	.....	26	.....	5	.....
1913.								
January.....	— 5.6	—26.4	—16.0	.....	15	1	15	.....
February.....	12.6	— 4.6	4.0	.....	6	.....	22	.....
March ¹	15.2	— 5.3	4.9	.....	18	.....	11	.....
April ²	19.2	— 3.5	7.8	.....	16	1	11	.....
May ¹	49.0	26.2	37.6	0.05	18	1	10	1
June ³.....	.....	.....	.....	.....	.....	.....	.....	.....
July ⁴	70.5	41.1	55.8	.35	14	1	15	3
August ⁵	55.2	36.8	46.0	1.09	4	5	21	11
September ²	45.5	27.4	36.4	.26	11	3	14	5
October ⁶	30.2	14.5	22.4	.48	2	3	20	4
November ¹	15.3	.6	8.0	.....	8	.....	21	.....
December ³.....	.....	.....	.....	.....	.....	.....	.....	.....

COPPER CENTER. Latitude 62°, longitude 145°. L. A. Jones, observer.

1912.								
December.....	5.2	— 9.4	— 2.1	1.61	2	17	12	4
1913.								
January.....	— 9.0	—24.5	—16.8	.83	11	7	13	1
February.....	21.1	3.2	12.2	.27	8	9	11	3
March.....	26.8	— 4.9	11.0	.....	19	6	6	.....
April.....	40.4	14.7	27.6	.....	6	19	5	.....
May.....	57.0	28.5	42.8	.15	10	18	3	2
June.....	73.4	39.5	56.4	.89	9	19	2	3
July.....	68.5	41.6	55.0	1.30	2	24	5	6
August.....	65.8	36.3	51.0	.99	7	18	6	3
September.....	54.6	30.5	42.6	1.46	8	14	8	4
October.....	36.3	10.8	23.6	.25	14	12	5	1
November.....	16.9	— 1.7	7.6	2.35	5	16	9	4
December.....	.....	.....	.....	.....	.....	.....	.....	.....

CORDOVA. Latitude 60° 35', longitude 146°. Edna M. Woodruff, observer.

1913.								
January.....	29.4	19.9	24.6	2.68	13	7	11	10
February.....	41.7	30.9	36.3	7.58	9	5	11	11
March.....	45.2	36.7	36.0	3.98	18	8	5	13
April.....	47.4	30.5	39.0	7.72	13	5	12	16
May.....	54.6	35.2	44.9	3.86	13	7	11	10
June.....	61.9	45.2	53.6	.74	18	4	8	6
July.....	60.8	48.7	54.8	12.77	5	2	24	19
August.....	64.5	46.9	55.7	8.46	14	3	14	16
September.....	58.5	43.1	50.8	19.08	7	5	18	23
October.....	55.1	34.4	44.8	15.09	15	2	14	16
November.....	42.2	28.7	35.4	17.19	10	2	18	19
December.....	36.6	29.5	33.1	16.02	5	.....	26	27

¹ For 29 days.² For 28 days.³ Not reported.⁴ July 18 omitted.⁵ Aug. 21 omitted.⁶ For 25 days.

Condensed meteorological reports—Continued.

DUTCH HARBOR. Latitude 53° 34', longitude, 166° 32'. Emil Ittner, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
January.....	36.8	28.3	32.6	4.16	8	7	16	11
February.....	39.3	32.1	35.7	9.82	7	3	18	17
March.....	41.8	32.2	37.0	11.84	7	9	15	20
April.....	39.7	31.7	35.7	2.48	2	7	21	10
May.....	44.9	34.9	39.9	4.00	1	11	19	17
June.....	51.9	42.1	47.0	3.50	4	8	18	13
July.....	55.2	44.7	50.0	2.82	6	10	15	12
August.....	56.1	45.4	50.8	2.94	5	3	23	10
September.....	51.7	41.3	46.5	8.46	3	9	18	15
October.....	46.5	35.1	40.8	7.28	4	13	14	12
November.....	40.7	31.6	36.2	5.09	.....	6	24	16
December.....	33.6	25.6	29.6	9.82	6	7	18	17

EAGLE. Latitude, 64° 40', longitude, 141° 5'. N. R. Meyers, observer.

1913.								
January.....	-18.4	-34.3	-26.4	0.62	18	1	12	7
February.....	14.0	- 2.8	5.6	.41	8	3	17	7
March.....	22.2	- 8.0	7.1	.65	13	5	13	8
April.....	39.9	8.7	24.3	.04	10	12	8	1
May.....	60.9	28.3	44.6	.39	11	11	9	6
June.....	76.1	36.1	58.1	.37	14	9	7	4
July.....	73.0	38.2	55.6	1.06	5	9	17	10
August.....	63.3	36.9	50.1	2.74	2	8	21	13
September.....	50.6	27.0	38.8	.56	2	7	21	8
October.....	29.5	10.6	20.0	.78	5	8	18	9
November.....	15.8	- 1.1	7.4	.26	5	7	18	6
December.....	3.8	-13.7	- 5.0	.46	5	3	23	6

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude, 64° 50, longitude, 148° 9'. J. W. Neal, observer.

1913.								
January.....	-14.8	-32.7	-23.8	0.43	20	3	8	8
February.....	14.8	- 7.0	3.9	.35	16	1	11	6
March.....	28.7	- 6.3	11.2	.85	17	2	12	5
April.....	46.4	12.1	29.2	.....	18	2	10	.....
May.....	60.9	32.8	46.8	.47	17	8	6	4
June.....	78.4	58.2	68.3	.44	18	9	3	2
July.....	73.0	54.5	63.8	2.25	5	9	17	9
August.....	61.2	42.7	52.0	3.70	6	5	20	19
September.....	50.8	31.5	41.2	.51	7	8	15	6
October.....	29.2	11.1	20.2	1.00	14	9	8	10
November.....	13.3	- 3.8	9.5	.26	12	5	13	4
December.....	5.7	-12.7	- 3.5	.15	7	10	14	3

FORT LISCUM. Latitude, 60° 27' 30'', ongtitude, 146° 27' 30''. Lieut. A. von Schroder, observer.

1913.								
January.....	25.4	14.2	19.8	4.26	16	3	12	11
February.....	33.0	23.7	28.4	6.85	6	5	17	15
March.....	34.7	19.0	26.8	5.19	14	8	9	11
April.....	41.2	26.8	34.0	2.57	9	14	7	15
May.....	47.2	35.1	41.2	10.11	8	17	6	13
June.....	59.4	42.8	51.1	.70	12	7	11	4
July.....	69.8	46.7	53.8	4.03	6	10	15	20
August.....	59.7	43.9	51.8	6.19	6	16	9	13
September.....	54.9	39.4	47.2	6.71	5	10	15	20
October.....	41.9	29.7	35.8	5.87	6	12	13	15
November.....	37.4	27.6	32.5	10.67	12	11	7	16
December.....	29.8	21.4	25.6	13.53	8	17	6	25

Condensed meteorological reports—Continued.

FORTMAN SALMON HATCHERY. Latitude, 55° 20'; longitude, 131° 40'. Fred Patching, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
January.....	28.5	17.6	23.0	8.96	9	3	19	20
February.....	39.1	25.8	32.4	5.74	7	2	19	16
March.....	40.5	24.6	32.6	14.64	9	5	17	20
April.....	47.6	31.8	39.7	14.70	1	7	22	27
May.....	56.0	36.9	46.4	12.70	4	8	19	24
June.....	65.9	44.3	55.1	4.18	7	5	18	20
July.....	66.5	47.6	57.0	11.46	8	6	17	22
August.....	67.6	48.8	58.2	10.38	9	6	16	18
September.....	56.8	44.3	50.6	23.97	3	2	25	24
October.....	48.7	36.8	42.8	19.07	1	4	26	28
November.....	42.1	32.6	37.4	20.88	2	3	25	26
December.....	39.2	29.8	34.5	22.53	6	1	24	18

HOLY CROSS. Latitude 62° 20', longitude 159° 50'. L. Sigonin, observer.

1913.								
January.....	-9.9	-14.5	-12.2	.....	17	.....	14	.....
February.....	15.9	9.7	12.8	.....	22	.....	6	.....
March.....	28.0	19.6	23.8	.....	14	.....	17	.....
April.....	27.7	15.5	21.6	.....	22	.....	8	.....
May.....	47.8	31.9	39.8	.....	15	.....	16	.....

JUNEAU. Latitude 58° 18', longitude 134° 24'. C. R. Reid, observer.

1913.								
January.....	26.7	19.2	23.0	5.21	9	3	19	21
February.....	38.4	30.0	34.2	4.43	10	2	16	14
March.....	39.5	28.1	33.8	4.20	12	2	17	17
April.....	45.2	33.8	39.5	3.67	4	6	20	24
May.....	55.6	40.0	47.8	4.73	11	11	9	20
June.....	68.2	47.7	58.0	.72	16	9	5	8
July.....	66.3	48.5	57.4	6.50	10	8	13	18
August.....	63.8	49.5	56.6	8.39	11	9	11	14
September.....	55.3	42.1	48.7	12.14	4	6	20	25
October.....	46.1	36.7	41.4	14.58	4	4	23	25
November.....	40.7	35.1	37.9	7.76	3	4	23	24
December.....	37.9	30.5	34.2	8.37	10	4	17	19

KETCHIKAN. Latitude 55° 25', longitude 131° 35'. A. P. Craig, observer.

1913.								
January.....	32.0	19.5	25.8	16.46	13	.....	18	18
February.....	42.7	26.6	34.6	8.17	16	.....	12	12
March.....	43.2	24.7	34.0	15.10	14	.....	17	18
April ¹.....	.....	.....	.....	.....	.....	.....	.....	.....
May.....	59.3	35.2	47.2	10.62	12	.....	19	19
June.....	69.7	41.7	55.7	4.97	12	.....	18	14
July.....	68.6	45.8	57.2	15.73	10	.....	21	19
August.....	67.7	45.8	56.8	11.87	15	.....	16	14
September.....	57.9	42.9	50.4	19.67	5	.....	25	24
October.....	51.3	35.1	43.2	17.69	6	.....	25	24
November.....	44.8	31.5	38.2	20.12	6	.....	24	25
December.....	42.8	29.5	36.2	18.47	9	.....	22	19

KLUKWAN. Latitude 59° 25', longitude 136°. Rev. F. R. Falconer, observer.

1913.								
January.....	16.6	0.3	8.4	1.67	16	3	12	10
February.....	33.6	18.2	25.9	.63	12	4	12	6
March ²	37.9	18.1	28.0	.63	17	2	12	8
April.....	47.4	28.5	38.0	1.01	8	7	15	9
May.....	59.3	34.2	46.8	.06	16	4	11	1
June.....	71.0	47.3	59.2	.76	17	4	9	7
July.....	68.0	46.5	57.2	1.35	16	1	14	12
August.....	65.9	43.8	54.8	1.83	14	4	13	10
September.....	55.9	41.8	48.8	3.59	3	5	22	22
October.....	42.0	28.8	35.4	4.05	12	2	17	15
November.....	33.8	21.4	27.6	2.88	2	5	23	20
December.....	29.2	16.0	22.6	4.22	7	5	19	19

¹ Not reported.² Temperature reported for 27 days.

Condensed meteorological reports—Continued.

KODIAK. Latitude 57° 45', longitude 152° 30'. M. D. Snodgrass, observer.

Month.	Temperature.			Total precip- itation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
March ¹	(2)	32.0	-----	3.13	-----	5	21	6
April.....	(2)	28.9	-----	2.97	11	8	11	9
May.....	(2)	36.2	-----	8.69	5	12	14	20
June.....	(2)	42.2	-----	2.73	6	16	8	10
July.....	60.0	46.9	53.4	3.62	-----	25	6	13
August.....	60.0	46.7	53.4	4.79	5	16	10	14
September.....	54.4	41.3	47.8	5.38	3	18	9	13
October.....	47.8	34.5	41.2	5.22	2	24	5	10
November.....	39.6	28.7	34.2	2.71	2	11	17	5
December.....	34.6	25.7	30.2	10.08	6	9	16	16

MILLER HOUSE. Latitude 65° 41', longitude 143°. J. F. Kelly, observer.

1913.								
January.....	-21.1	-34.0	-27.6	-----	-----	-----	-----	-----
February.....	9.8	-6.5	1.6	-----	-----	-----	-----	-----
March.....	17.4	-7.3	5.0	-----	-----	-----	-----	-----
April.....	41.0	3.4	22.2	-----	-----	-----	-----	-----

NOME. Latitude 64° 30', longitude 165° 24'. Mrs. N. S. Jolls, observer.

1913.								
January.....	5.0	- 7.4	- 1.2	0.36	16	2	13	4
February.....	21.0	9.2	15.1	.48	11	3	14	4
March.....	25.1	14.1	19.6	.31	14	4	13	3
April.....	27.7	11.9	19.8	.18	22	3	5	2
May.....	44.0	31.8	37.9	.27	9	8	14	5
June.....	61.5	44.8	53.1	.32	16	3	11	6
July.....	59.4	45.1	52.2	1.40	9	4	18	9
August.....	54.3	40.9	47.6	1.93	6	6	19	12
September.....	46.8	32.2	39.5	.64	11	5	14	11
October.....	35.2	24.3	29.8	2.30	10	1	20	8
November.....	22.8	11.7	17.2	1.85	9	7	14	7
December.....	12.2	- .4	5.9	.61	13	5	13	7

POINT HOPE. Latitude 68° 30', longitude 166° 50'. O. W. Rank, observer.

1912.								
November.....	-12.8	(3)	(3)	(3)	14	9	8	-----
December.....	- 4.3	(3)	(3)	(3)	19	4	8	-----
1913.								
January.....	-10.8	(3)	(3)	(3)	19	4	8	-----
February.....	4.4	(3)	(3)	(3)	8	6	14	-----
March.....	- 5.0	(3)	(3)	(3)	26	1	4	-----
April.....	21.9	(3)	(3)	(3)	26	1	3	-----

RAMPART. Latitude 65° 30', longitude 150° 15'. G. W. Gasser, observer.

1913.								
January.....	-21.6	-33.6	-27.6	0.18	17	4	10	5
February.....	9.6	- 4.8	2.4	.47	7	2	19	6
March.....	19.0	- 8.0	5.5	.32	17	4	10	3
April.....	37.8	9.6	23.7	.01	10	16	4	1
May.....	63.4	32.0	47.7	.83	14	11	6	6
June.....	79.4	45.9	62.6	.41	18	11	1	7
July.....	77.7	45.0	61.4	1.41	7	12	12	7
August.....	65.7	40.6	53.2	1.22	3	8	20	12
September.....	45.1	30.0	37.6	1.24	8	8	14	9
October.....	27.8	10.5	19.2	1.23	11	4	16	9
November.....	6.2	- 6.1	0.0	.74	3	4	23	4
December.....	- 5.2	-19.7	-12.4	.65	5	6	20	4

¹ Temperature reported for 26 days.² No maximum thermometer.³ No record.

Condensed meteorological reports—Continued.

SEWARD. Latitude 60° 6', longitude 149° 26'. W. A. McNeiley, observer.

Month.	Temperature.			Total precipitation. ✓	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
January.....	25.9	13.9	19.8	2.76	17	4	10	9
February.....	37.9	28.0	33.0	3.52	7	13	8	11
March.....	40.2	26.8	33.5	3.37	13	9	9	13
April.....	43.4	30.3	36.8	6.24	12	7	11	18
May.....	51.6	36.5	44.0	2.68	12	12	7	9
June.....	60.5	41.6	52.6	.05	19	7	4	2
July.....	61.1	47.8	54.4	4.82	11	9	11	12
August.....	61.4	45.4	53.4	2.90	16	9	6	9
September.....	56.8	41.7	49.2	10.83	12	8	10	13
October.....	46.5	31.9	39.2	8.78	15	4	12	13

SITKA. Latitude 57° 3', longitude 135° 20'. C. C. Georgeson, observer.

1913.								
January.....	34.6	24.5	29.6	10.42	9	1	21	25
February.....	43.9	31.5	37.7	6.83	6	6	16	19
March.....	45.6	30.1	37.8	3.79	10	6	15	15
April.....	46.8	33.4	40.1	6.10	3	4	23	24
May.....	53.5	39.4	46.1	3.98	5	5	21	18
June.....	60.7	46.0	53.4	.75	5	8	17	12
July.....	62.2	47.6	54.9	2.81	8	2	21	20
August.....	63.3	49.0	56.2	9.07	7	4	20	24
September.....	57.9	44.7	51.3	9.30	5	5	20	25
October.....	50.8	39.3	45.0	16.58	1	4	26	26
November.....	46.3	35.2	40.8	11.88	3	6	21	25
December.....	46.3	33.5	39.9	5.67	11	2	18	19

SKAGWAY. Latitude 59° 5', longitude 135°. H. D. Clark, observer.

1913.								
January.....	18.6	11.5	15.0	0.15	10	4	17	2
February.....	35.9	28.5	32.2	.75	7	7	11	2
March.....	37.8	25.3	31.6	.35	14	5	11	3
April.....	46.5	32.3	39.4	.65	3	13	14	4
May.....	58.5	39.1	48.8	.25	4	12	15	3
June.....	68.9	43.2	56.0	.30	6	15	9	3
July ².....	.....	.....	.....	.....	.....	.....	.....	.....
August.....	65.3	45.3	55.3	3.65	5	9	16	10
September ².....	.....	.....	.....	.....	.....	.....	.....	.....
October.....	43.7	35.7	39.7	4.81	.....	14	17	15
November.....	38.5	28.5	33.5	.....	1	12	17	.....
December.....	33.4	26.7	30.0	.....	2	10	³ 18	.....

SUNRISE. Latitude 66° 54' 30'', longitude 149° 35'. A. Lawson, observer.

1913.								
January.....	14.1	1.7	7.9	0.96	8	4	19	16
February.....	33.4	21.5	27.4	1.37	8	5	15	11
March.....	33.7	17.3	25.5	.45	15	2	14	11
April.....	39.2	22.6	30.9	3.17	7	6	17	18
May.....	53.4	30.7	42.0	.78	9	11	11	11
June.....	66.2	38.5	52.4	.07	19	5	6	2
July.....	64.6	43.2	53.9	1.61	9	9	13	15
August.....	63.4	40.1	51.8	2.04	11	5	15	12
September.....	55.2	33.5	44.4	3.70	10	5	15	16
October.....	41.9	25.1	33.5	4.35	11	3	17	18
November.....	28.8	13.7	21.2	4.67	11	3	16	13
December.....	29.2	14.3	21.7	5.01	5	5	21	21

¹ Mar. 31 omitted.² Not reported.³ Dec. 31 omitted.

Condensed meteorological reports—Continued.

TANANA. Latitude 65° 13', longitude 152° 2'. Violette J. Page, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1913.	° F.	° F.	° F.	Inches.				
January.....	-17.2	-29.6	-23.4	0.41	20	4	7	9
February.....	13.1	- .9	6.1	.86	9	5	14	10
March.....	18.7	- 2.1	8.3	.75	19	6	6	5
April.....	34.7	13.1	23.9	.12	20	6	4	2
May.....	59.1	33.0	46.0	1.57	9	12	10	11
June.....	77.0	45.5	61.2	.20	14	9	7	4
July.....	72.1	44.1	58.1	1.70	5	5	21	13
August.....	61.1	39.0	50.0	1.79	2	8	21	16
September.....	44.9	28.7	36.8	1.28	9	8	13	11
October.....	25.4	12.6	19.0	-----	12	5	14	9
November.....	7.8	- 7.8	0.0	1.11	9	9	12	13
December.....	- 3.1	-18.5	-10.8	.50	10	14	7	9

VALDEZ. Latitude 61° 7', longitude 146° 20'. Mrs. Laura Jones, observer.

1913.								
January.....	20.1	7.0	13.6	4.00	-----	-----	-----	15
February.....	29.7	17.5	23.6	8.63	-----	-----	-----	14
March.....	30.3	14.0	22.2	1.43	-----	-----	-----	7
April.....	38.2	22.7	30.4	2.82	-----	-----	-----	15
May.....	48.3	29.3	38.8	1.78	-----	-----	-----	13
June.....	64.3	42.4	53.4	.64	-----	-----	-----	5
July.....	61.5	43.8	52.6	4.38	-----	-----	-----	24
August.....	60.0	41.0	50.5	6.20	-----	-----	-----	19
September.....	54.6	37.6	46.1	6.95	-----	-----	-----	19
October.....	43.4	30.7	37.0	4.66	-----	-----	-----	18
November.....	32.7	18.6	25.6	6.20	-----	-----	-----	17
December.....	28.9	14.6	21.8	8.03	-----	-----	-----	22



